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COVERS ALL PHASES OF THE PRODUCTION AND MARKETING OF CRUDE RUBBER AND THE MANUFACTURE AND DISTRIBUTION OF RUBBER GOODS

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Vol. 43 August, 1938 No. 5

New Inks from Rubber

A Description of the Manufacture and a Discussion of the Applications of Heat Liquefied Rubber Inks

By R. A. Crawford and Don B. Forman
Research Laboratories, B. F. Goodrich Company

THE attractiveness and durability of branding manufactured articles are important considerations in any program of merchandising. The manufacturer must rely upon brands for the identification of his products after months or years of use. Many interesting examples are afforded in relation to the fabrication of rubber goods. In this field, the durability of brands often requires special consideration because of the abrasive wear to which many rubber articles are subjected.

However, it is not the purpose of this paper to discuss the development of branding rubber products. E. A. Sprigg (1) has recently reviewed this problem. In his discussion there was a brief description of the use of oil inks and one of the new Goodrich inks was included, although the latter was not described in detail.

The serviceability of rubber in the printing trade has long been established, comprising such important units as press rollers, offset blankets, and printing plates. Even in the realm of inks the use of rubber is not new, since both rubber cements (2) and latex (3) have been employed for years. Several rubber derivatives have also been suggested as ink vehicles. Chlorinated rubber (3) and reaction products of rubber with amphoteric halides (4) have found use where chemical resistance is required. Millar (5) claims to have produced a gummy, plastic material by heating rubber and vegetable oils under pressure, and recommends its use as an ingredient in printing ink.

For the past four years the important problems of developing satisfactory inks for branding rubber goods and for use with rubber printing plates have been under investigation by the Goodrich research staff. Although many materials were investigated as ink vehicles, none of them caused less rapid swelling and deterioration of rubber plates than the standard lithographic varnishes. It was then logically assumed that an ink vehicle made from rubber, containing no solvents, would probably cause less swelling of rubber plates than present commercial materials. Since crude rubber can be softened and liquefied under proper conditions at elevated temperatures and since its unsaturation can be controlled to a value equivalent to that of a drying oil, liquefied rubber, if properly prepared, should be a good drying ink vehicle.

Inks of excellent quality were made with the new heat liquefied rubber. Swelling of plates was found to be considerably less than that caused by vegetable oil inks. Partial hydrogenation of the liquefied rubber

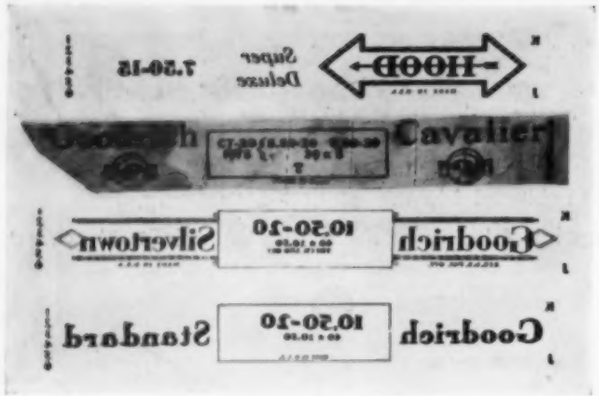

FIG. 1—Transfer labels after three years of service.

produced further improvement. However, since improved rubber plate compounds recently made by Goodrich chemists have been highly resistant to the action of oil inks, the need for special inks has become unnecessary.

Meanwhile, methods in use for branding rubber goods were generally expensive and usually unsatisfactory. Printing processes could be applied only to a limited extent because available inks would not produce an attractive and permanent label. However, inks made from heat liquefied rubber were found to produce excellent results and made possible the successful development of the labelling technique described by E. A. Sprigg (1). The manufacture of these inks, as well as their uses, will now be discussed.

Liquid Rubber

Liquid rubber for printing inks is prepared by subjecting rubber to high temperatures (250°C. upward). The vehicle can be made either from crude rubber or from selected vulcanized scrap. Cured inner tube and pure gum compounds, having rubber content in excess of 70%, produce the best results (6).

The apparatus consists of an oil-fired kettle equipped with an agitator and a condenser. The rubber is heated under carefully controlled conditions until desired consistency is obtained. During the process some distillate is collected. By adding a mixture of this distillate, the viscosity (Stormer) and the specific gravity of the liquid rubber are brought to standard values.

FIG. 2—Direct printing of inner tubes.

It is then tested in an ink made to a standard recipe. Occasionally, determinations of acidity and unsaturation are also made.

Ink Manufacture

The process of ink manufacture comprises three major operations: compounding, mixing and grinding. Compounding consists of weighing the ingredients individually or in the form of masterbatches. The weighed batches are then intimately mixed mechanically or by hand, depending upon the size of the batch, and then transferred to a three-roll ink mill for grinding. Time of grinding depends upon the consistency of the ink and the roll adjustments. The number of passes received by a batch usually varies from four to eight. The processes just described apply to all ink recently developed in the Goodrich laboratories.

Non-Drying or Vulcanizing Inks

The unsatisfactory results in labeling rubber goods attained by the use of oil-base inks and rubber cements made desirable the development of an improved ma-

FIG. 3—Branding of packings and belts.

terial for this purpose. Rubber cements containing volatile solvents, though frequently characterized by poor coverage, generally produced good brands but were difficult to use because they dried on the printing equipment. Oil inks, although possessing excellent printing properties, did not produce satisfactory labels. Whether applied by transfer label or direct printing, these brands even after the goods were vulcanized had poor resistance to smudging and abrasion. Furthermore, transfer labels made with oil-base inks eventually dried out and could not be used, although their life could be prolonged by the use of anti-oxidants in the ink. Moreover, both cement and oil-base inks harden in their cans after frequent exposure, thus causing a large percentage of ink to be wasted.

These difficulties were eliminated by the introduction of liquid rubber inks, which made practical for the first time the application of permanent non-smudging labels by printing processes. The new inks handled well on the various printing presses. Transfer labels made from these inks have been stored as long as two years without becoming unserviceable. Vulcanization of the printed rubber articles produces solvent and smudge-proof brands, since vulcanizing ingredients migrate into the ink film. On a poundage basis,

the inks go much further than those previously used because they do not dry out in the cans. Choice of color in the inks has depended upon dye and pigment stability towards vulcanization temperature. The outstanding colors have been black, orange, silver, and white.

The inks may be applied to the rubber by direct printing or transfer labels. Consistency may be altered according to the requirements of individual printing presses. Either rubber or metal type may be used. When the brands are printed directly (Fig. 2) on uncured rubber, it is noted that subsequent dusting of the printed surface with soapstone, mica, or zinc stearate assure the prevention of offsetting in the mold.

In addition to the printing of transfer labels (Fig. 1), specific uses of this method include the labeling of inner tubes (Fig. 2), conveyor and transmission belts (Fig. 3), inflated toys, shoes (Fig. 4), and tires.

Drying Inks

The second classification of liquid rubber inks covers those that dry by oxidation at ordinary temperatures.

FIG. 4—Design printing with liquid rubber ink. This shoe was printed before vulcanization.

These inks are very similar to conventional oil-varnish inks. They possess the same excellent qualities as litho-varnish inks and exhibit a greater adhesion to rubber surfaces. Drying liquid rubber inks may be applied in the same manner as the non-drying inks, except that they are usually applied after vulcanization and, of course, are not suitable for transfer labels. The process of manufacture of these inks is identical with that previously described.

Compounding is similar to that of the non-drying inks except for the addition of driers; of these, metallic oleates and linoleates have produced the best results. A wider variety of colors is available since the pigments do not have to stand vulcanization temperatures.

The inks may be used to label directly any article previously mentioned. They are also being used to label or mark hose (Fig. 5), super heat packing (Fig. 3), balls, fan belts, V-belts, rubber bearings, battery boxes, and footwear (Fig. 6).

Liquid rubber inks have been particularly attractive to small users because they do not possess the pronounced skinning effect of litho-varnish inks, even though their drying rates approximate those of commercial half-tone or job inks. They also respond to press room reducers, show good coverage, distribute

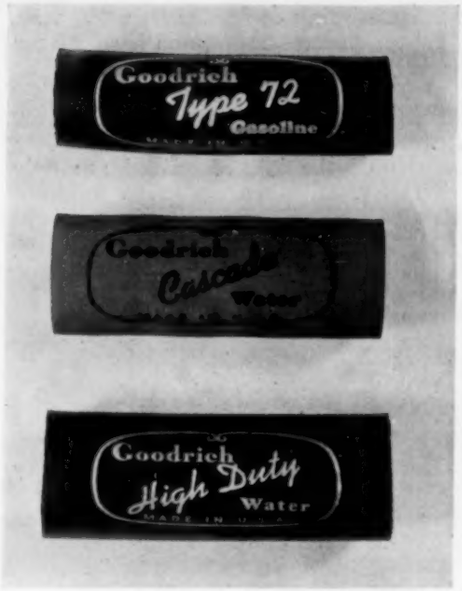

FIG. 5—Hose labels, printed after vulcanization.

well on rolls, age satisfactorily, and produce good printed detail. Their chemical resistance has been found to be greater than that of ordinary oil inks.

Fast Drying and Super Adhesion Inks

The third type of ink is of the most recent origin at Goodrich. It was developed in order to meet the competition offered by fast drying inks, *i.e.*, inks drying by evaporation in a very short time. The vehicle (patent applied for) consists of thermoprene (7) blended with a drying liquid, *i.e.*, vegetable oils, litho-varnishes, and liquid rubber. The thermoprene is handled in the form of a solution. The choice of solvent for the thermoprene depends upon the drying rate desired.

The inks are manufactured in a manner similar to the others. In most instances, the printing application is the same, except that rapid handling is usually required. Drying may be accomplished by evaporation at room temperature or may be accelerated by elevating the temperature.

Specific uses include the manufacture of miscellaneous small labels to be attached to various articles,

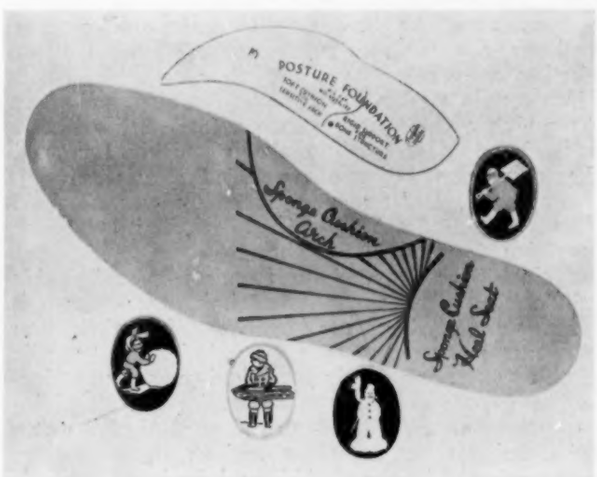

FIG. 6—Assortment of footwear labels.

and the direct labeling of garden hose (Fig. 5), balls, V-belts, rubber-coated textiles, and hard rubber products. While retaining the good qualities of the ordinary drying inks, inks of this third class exhibit greatly increased adhesion to rubber and a more flexible drying range.

Limitations of the inks described are only of a minor character. Color has already been discussed. The ink films have sufficient flexibility to permit application on all rubber products except toy balloons. The odor of liquid rubber inks is different and somewhat more penetrating than that of oil inks, but the dried films have no detectable odors.

This paper has emphasized the use of rubber inks for printing on rubber surfaces, but it has been demonstrated that they can be used satisfactorily also on certain molded plastics, leather goods, parchment paper, sheet metal, and certain kinds of paper applications. The general paper field is not being overlooked.

Research work has been in progress for some time on the development of typographic and lithographic inks. The first two types of ink may be used on any of the common makes of printing presses, but the third type requires special equipment. Inks have been compounded to operate on many "built-to-order" presses designed for special purposes.

Finally, the new inks have solved many difficult branding or labeling problems; and in view of their wide range of application, many new and interesting uses are expected.

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Octyl Alcohol—Anti-Foaming Agent

RECENT investigations by the Carbide and Carbon Chemicals Corporation, New York City, have indicated that correct concentration is essential for best results in using octyl alcohol to prevent foaming in many industrial operations. In one investigation it was determined that the maximum defoaming effect for latex was obtained with a concentration of octyl alcohol equal to its solubility in water—about 0.15% by weight at 25° C. Used as an anti-foaming agent for latex, octyl alcohol suppresses the foam without affecting coagulation.

For certain applications, it was found that the use of too high a concentration caused foaming instead of preventing it, this condition being quickly corrected when the concentration of octyl alcohol was reduced. The optimum anti-foam concentration was obtained when a saturated solution of octyl alcohol and water was formed, as mentioned above.

Typical operations where foaming is undesirable include the lubricating-oil reclaiming process; the manufacture of dyes, varnish inks, paint, alum, and beet sugar; formation of print solutions for textile printing; operation of air conditioning units; production of paper; grinding of dyestuffs; etc. Brief investigations on the advantages of octyl alcohol as an anti-foaming agent for these various processes have been conducted by the Carbide and Carbon Chemicals Corporation. Subsequent data will be released.

Bead Form Carbon Black

THE problem of dust control in rubber factories, particularly in tire plants, is one that has long occupied the attention of industrial engineers. The use of carbon black, as a rule, invariably raised one of these problems. Because carbon black is mixed dry it has a tendency to fly. Heavy compression reduces this tendency but makes it hard to disperse. Since the reinforcing power of carbon black is a function of its dispersion, tire treads mixed with too solid black do not deliver the mileage inherently possible in such a compound. These considerations led to the development of the bead form of carbon black. This development was described by Charles R. Haynes of the Binney & Smith Company, New York, in a recent issue of *Chemical & Metallurgical Engineering*, as follows:

In general, when it is necessary to reduce the tendency of fine particles to fly, the commonly used procedure is to agglomerate them by introducing a binding material dissolved in a volatile solvent. With carbon black, however, this is impractical: first, because of the large amount of such binder that must be added to cover the extensive surface of the particles; second, because the black thus agglomerated is difficult to disperse since the particles adhere to one another after drying; and third, because the rubber manufacturer prefers raw materials unadulterated, in order that he may do his own compounding.

The simple addition of water to the carbon black in sufficient quantity to form a slurry and subsequent evaporation of the water from this paste leaves the black in a harsh condition not easy to disperse and in irregular fragments which may revert to dust during transportation. Experiments showed that black, wet with water, could be compacted into spherical pellet form by adding a comparatively small amount of gasoline or similar volatile liquid immiscible with water, and agitating the mass. The gasoline displaced the water and was easily expelled by drying at low temperature, leaving pellets of soft texture, uniform size, and good dispersing qualities. This method lacked, however, the primary requisite of economy of operation, so further experiments were prosecuted.

One important result of the two-liquid method just mentioned was to show that beads could be formed under proper conditions of agitation even when the processing liquid was present in proportion far below that necessary to form a continuous phase or free meniscus. Acting on this lead, the final simplification was attained by the use of water alone, in comparatively small quantities, with careful control of the type and duration of agitation and the conditions of drying.

Through regulation of the quantity of water used and the agitation, it is possible to govern the size of the spherical pellets formed and insure their uniformity. A typical Micronex bead has a diameter of 0.026 inch and consists of a thin, friable skin of relatively firm texture, inclosing a porous interior of loosely piled particles of carbon black which, when the skin has been ruptured, are easily dispersed in compounding with rubber.

To Owners of Noble's "Latex in Industry"
(Purchased Prior to November, 1937)

The author has prepared an addenda and errata list which represents not only errors in patent numbers and typography but which includes a number of references originally omitted from the book. This list, in printed form which may be readily pasted into the original copy, is available without cost. Address requests to THE RUBBER AGE, 250 West 57th Street, New York City.

Oxidation Products of Rubber: Rubbone

By H. P. Stevens and F. J. Popham

RUBBONE has previously been prepared by blowing oxygen through a solution of rubber in white spirit in the presence of cobalt linoleate. An improved "dry" method of manufacture now described consists of milling the rubber with catalyst and an additional reagent, which may consist of cellulose or wood flour. The product is extracted with a suitable solvent to separate the rubbone, or in some cases it can be used directly; thus it may be made the basis of a molding powder, and also the milled mixture of rubber and catalyst with drying oil forms a baking varnish. The physical and electrical properties of rubbone are briefly described. Rubbone can be vulcanized to yield ebonite-like products. A chlorinated rubbone may be prepared by milling the reactants with a hypochlorite. Direct chlorination in solution results in a highly chlorinated product. The tendency to gel may be corrected by the addition of coumarone. This and the hydrochloride yield alkali-resistant films.

THE oxidation products of rubber have received considerable attention both from the academic and technological points of view *(1, 2)*. The present account deals with subsequent work on the oxidation product, termed rubbone, and its derivatives.

Shortly, rubbone is a viscous gum, yellow to orange-red in color, containing oxygen corresponding approximately with $C_{10}H_{16}O$. The material obtained on a commercial scale consists of three fractions described as *A*, *B*, and *C*. These are distinguishable by their solubilities, as follows: *A*, soluble in white spirit and aromatic hydrocarbons, insoluble in acetone and alcohol; *B*, soluble in white spirit and aromatic hydrocarbons and acetone, insoluble in alcohol; *C*, soluble in acetone, aromatic hydrocarbons, and alcohol, insoluble in white spirit.

The commercial product consists mainly of fraction *B*, with very little of fraction *A* and 10 to 20% of fraction *C*. If this be distilled to a temperature of 350° a certain amount of destructive distillation takes place. Some dipentene is formed, which is not unexpected. A fraction between 200° and 300°, however, was found to contain polyhydric phenols. The amount of these was not large, being of the order of 1% on the original rubbone, but their presence is of interest. The washed neutral oils closely resemble rosin oil, formed by the destructive distillation of colophony. The amount of destructive distillation is not great, and the bulk of the rubbone (80%) remains as a still tacky gum, rather dark in color, above 350°.

Methods of Preparation

The method previously described *(3)*, namely by blowing air through a 20% solution of rubber in white spirit in the presence of cobalt linoleate, has been developed to a semi-commercial scale and several hundredweights of rubbone have been produced. The commercial product probably contains a little high-boiling petroleum residues which act as plasticizers and are useful rather than detrimental but offer difficulties if it is desired to remove them to ascertain the properties of the purified products.

A more concentrated solution can be employed if the aëration is conducted under pressure, thus reducing the loss of solvent by volatilization in the exhaust gases *(4)*. An alternative method of circulating oxygen under pressure is not recommended. The reaction is exothermic and is not easily controlled.

A third method of manufacture has been evolved which has proved to be of considerable interest from both the commercial and theoretical points of view as it dispenses with the use of a solvent and consequently yields products free from any petroleum residues.

Since the process consists essentially in adding oxygen to catalyzed rubber, that is rubber into which a catalyst has been milled, it seemed likely that the oxidation could be effected by disposing the rubber in a thin film and exposing it to the action of air at a reaction temperature of, say, 75 to 80°. This was accomplished by adding to the catalyzed rubber on the mill a powdered material offering a large surface. The resultant product was then extracted with a suitable solvent or used directly in the powder form for certain applications—molding powders for example.

Experiments were tried with various media and a somewhat unexpected reaction was discovered. With such materials as kieselguhr, slate dust, powdered asbestos, etc., the amount of oxidation even with prolonged milling was comparatively low. It rarely amounted to 10% of the possible conversion into rubbone.

With cellulosic materials such as wood flour, wood pulp, paper, cotton wool, etc., the reaction was so rapid that frequently the material charred with the evolution of strong aldehydic and acid fumes. Leather dressings and wool behaved similarly. At first it was thought that this reaction was purely a surface phenomena, but carefully measured experiments demonstrated conclusively that some reaction was taking place in which the cellulose was playing an important part, possibly acting as a second catalyst. The catalytic oxidation of cellulose with cobalt linoleate was also confirmed. The reaction varies proportionally to the quantity of cellulose present and for a given amount is greatest with cotton and least with wood flour.

It has been found that the addition of a small quantity of fine neutral and inert material or fillers, such as whiting, amounting to no more than 15%, accelerates the action considerably. Apparently such fillers function as grinding media for the cellulosic material, thereby offering the necessary surface in the minimum of time. The whole reaction is begun and completed on hot rolls as ordinarily used in rubber milling *(5)*.

The following tables illustrate some of the results

This article is reprinted from the April, 1938, issue of the *Journal of the Society of Chemical Industry*, London, England.

obtained by the "dry" method. Figures are calculated on the amount of "catalyzed rubber" taken. 20% of kieselguhr was used in each case.

TABLE I

Source of cellulose	*% taken*	*% conversion measured by acetone extract*
Cotton	50	30
"	65	80
Chemical wood pulp	30	5.6
" " "	40	5.0
" " "	50	7.5
" " "	60	27.0
" " "	70	62.5
" " "	75	64.0
" " "	80	76.0
" " "	85	77.0
Wood flour	100	3.0
" "	150	13.0
" "	200	90.0

Basing the figures on the above table, the efficiencies of the three catalysts, putting wood flour = 100, are approximately as follows: wood flour 100, wood pulp 250, cotton 325. Mixtures were made from cotton and wood flour to give a cellulose content of approximately 66%. The following results were obtained:

Cotton	*Wood flour*	*% conversion measured by acetone extract*
40	80	22.0
34	100	36.5
28	120	48.5
20	140	59.0
14	160	71.0
7	180	82.0
Nil	200	80.0

The increase is practically a linear function of the content of wood flour, which presumably offers the surface required.

An 80% conversion can be obtained from 65 parts of cotton and 20 parts of kieselguhr, from which it may be inferred that the surface effect of kieselguhr in conjunction with cotton is considerably better than that of wood flour.

The product is a soft, powdery material which becomes hard on cooling. It is readily extracted with solvents so that it can be used as a source of rubbone or any rubbone fraction it may be desired to produce. Material thus prepared can be used as the basis for the manufacture of other derivatives, such as the hydrochloride, chlorinated compounds, or vulcanized compounds. Also for the preparation of these derivatives the reaction mixture can be used without previous extraction (see later under "Chlorine Derivatives").

Properties of Rubbone

The principal properties, previously described *(2)*, may be summarized briefly. When heated out of contact with air rubbone slowly polymerizes until it acquires the form of a tough, non-tacky gel similar to polymerized wood oil. When heated in contact with air further oxidation takes place and the material becomes hard and brittle. In this condition it is not of much value. It is, however, readily miscible with drying oils, which act as plasticizers for it. The drying oils retard polymerization. On the other hand rubbone accelerates the oxidation of polymerized linseed oil.

It is thus possible to formulate a baking varnish suitable for the lacquer industry and for the electrical industry by simply adding stand oil to a solution of rubbone in solvent naphtha. The tedious and somewhat costly method of gum running is thus avoided. The film produced by the oxidation of such a mixture is extremely flexible and tough. It adheres well to metals such as iron, tin, aluminum, and zinc, but not so well to copper. It is also resistant to organic acids normally associated with fruit juices and therefore suitable for lacquering tins as indicated below.

Polymerization:—The polymerization of rubbone measured in terms of increased viscosity is shown in Fig. 1, in which viscosity has been plotted against time. The inhibiting effect of stand oil is also shown. Certain agents accelerate polymerization of which the following are a selection: oxalic acid which gives a very marked result; also benzoyl peroxide, phosphoric acid, succinic acid, cinnamic acid, tannic acid, phthalic anhydride, toluidine.

Resistance of films to weak acids:—It has been shown *(6)* that when citric, tartaric, or acetic acids act on a piece of tinned sheet the rate of attack can be ascertained by the amount of iron found in solution. This method was applied to tin sheet lacquered with rubber varnishes with the following results. The varnishes employed were made by dissolving rubber (40 parts) milled with 2½% of cobalt linoleate in white spirit and 60 parts of either stand oil or raw linseed oil. These were broken down with white spirit in the proportion of 25% by weight of above base and 75% by weight white spirit. Ordinary fruit tins were cleaned and lacquered with two coats of the varnishes and baked for 1½ hours at 155°. During the baking the rubber is converted into rubbone and forms a hard, resistant film in conjunction with the oil. The solution used for corrosion tests was 0.5% citric acid with a pH value of 2.4. This has been found to give the maximum corrosion. Two sets of tests were made over prolonged periods, one cold and another an accelerated test at 70°. The course of corrosion was noted by a color test. By taking a small quantity of the citric acid under test, diluting, and adding ferro-cyanide the color could be matched against standard Prussian-blue suspensions and an approximate estimation of the corrosion determined. The results given below are expressed as grams of iron per 1,000 sq. cm. of surface.

Period in days	*Stand oil*	*Linseed oil*
	COLD TEST	
9	0.20	0.005
13	0.42	0.07
52	0.45	0.27
	HOT TEST at 70°	
1	0.03	0.02
3	0.20	0.20
6	0.25	0.30

After 6 days (when the films were rather soft) the samples were tested for tin, with the following results: stand oil film 0.005%; linseed oil film 0.015% (the amount of tin permissible in food is 0.03%).

A further set of tins were similarly lacquered but were heated at 120° for 18 hours. After baking in order to mature the film and when tested by the accelerated test they showed similar amounts of corrosion as far as dissolution of iron was concerned, but tin was absent.

Several tins lacquered by other processes which had contained strawberries, peas, raspberries, and red currants were treated with citric acid by means of the above described test. The amounts of iron dissolved after 6 days were 1.08, 0.27, and 1.8 g. respectively; tin was present in traces only. The rubbone varnish would therefore appear to be quite comparable with the ordinary commercial lacquers used for this purpose.

Electrical Tests:—A detailed account of the electrical properties of rubbone has already been published

(7). The main properties are as follows: breakdown voltage, 57—76 kv.; dielectric test on paper samples: 1 mil tissue paper, 625 volts per mil; 5 mil pressboard, 785 volts per mil; specific resistance, tested at 70° after 3 hours at 110°, 2.2×10^9; tested at 20° on cooling, 2.8×10^{11}; tested at 70° after 50 hours at 120° in contact with copper, 1.0×10^{10}.

Considerable improvements were effected by applying the rubbone in the form of baked varnishes. For this purpose mixtures with stand oil were made in a manner similar to those used for baking lacquers.

The outstanding properties of the material in their relation to its electrical applications would appear to reside in the high moisture-resisting properties of the baked film and in the increased strength given to asbestos millboard when treated and baked with rubbone mixtures.

Vulcanization of Rubbone

Rubbone readily reacts with sulfur in a manner similar to raw rubber to form vulcanized products. Those corresponding with low and medium combined sulfur are of no particular interest but as the percentage of sulfur approaches that of hard rubbers some interesting products are formed. In the first place hardening is very rapid, two hours at 100° with 10% of sulfur being sufficient to produce a product which is hard and brittle when cold although retaining some thermoplastic properties. The hardening may be caused partly by vulcanization and partly by the heat-hardening properties of the resin. A detailed study of the vulcanization and properties of rubbone will be published later.

The technical interest also lies in the possibility of making molding powders. For this purpose a rubbone-paper mix can be utilized with or without added filler. There is no need to extract the rubbone. In fact the operation can be continued from the preparation of the reactive mixture without removing the material from the rolls. It is only necessary to add the sulfur, etc., mill, sheet, and complete the vulcanization for a few hours at 100°, finally grinding in order to obtain a thermoplastic molding powder. It is also possible to obtain such a powder without the addition of the sulfur, but moldings from these powders lack strength. The chief value of these molded products lies in their excellent anti-tracking properties. It has also been found that if the vulcanizable sheet, prepared as above, be softened with rosin oil and thinned with solvent naphtha an excellent cement is obtained for cementing rubber to metal.

Another possible application of the material is to be found in the formation of a vulcanizable cement for emery and carborundum wheels, and some success has been obtained in this direction. The quality of the vulcanizable cement depends in part on the reinforcing character of fillers. With rubbone cements the effects produced by the filler do not necessarily follow the same order as in the case of rubber. The following results indicate some of the differences. Cements were made according to the following table. The mixtures were thickened by heating at 100°. After thickening they were milled with 3 parts by weight of silica (300-mesh) and sheeted. Dumb-bell-shaped test pieces were cut from the sheet, vulcanized at 110° for 24 hours, and tested between grips in a Schopper machine.

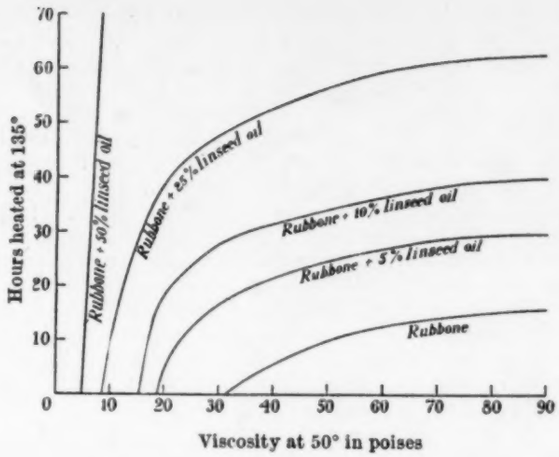


FIG. 1—Viscosity of rubbone-linseed oil mixtures.

The pronounced reinforcing action of silica was unexpected and has since been confirmed.

It is obviously advantageous from the commercial point of view to form a cement from the rubbone-paper mix obtained in the course of manufacture. Samples of these were vulcanized and tensile tests were made. The results appeared to depend to some extent on the sulfur content as well as on the varying proportion of the different rubbones present. For example, a mixture containing only 5% of sulfur calculated on the rubbone showed a tensile strength of 1.78 kg. per sq. mm. compared with 0.92 kg. for the same material compounded with 10% of sulfur. Other samples consisting of rubbone *A* and of rubbone *A* plus unconverted rubber showed tensile strengths varying from 0.16 to 0.47 kg. Vulcanized products containing zinc oxide or magnesium oxide were unexpectedly weak.

Chlorine Derivatives

Hydrochloride:—In common with other substances of a similar build, both rubber and rubbone form additive compounds with hydrochloric acid. The rubbone product is readily prepared by passing dry hydrochloric acid gas into a cooled solution of rubbone in xylol. The hydrochloride is not readily soluble in white spirit and the solution soon gels much in the same way as a rubber sol to which a small proportion of sulfur chloride has been added. It is not possible to add molecular quantities of acid without the liquid gelling, and the partly saturated material gels after setting aside for a time. A film obtained by rapid evaporation possesses excellent alkali-resisting properties and but for the tendency to gel would probably find a useful application in this direction.

One rather remarkable property is its capacity for allowing alkali to pass through without being itself affected and without the alkali affecting pigment sus-

	Cement					Filler	Breaking load kg. per sq. mm.	Breaking strain elongation
	Rubbone	*Sulfur*	*Zinc oxide*	*China clay*	*Litharge*	*Silica 300-mesh*		
(1)	100	100	40.0	—	—	—	0.52	5.0
(2)	100	10	5.0	35	—	—	0.27	5.0
(3)	100	15*	5.0	—	35	—	0.43	5.0
(4)	100	10	5.0	—	—	35	1.22	7.5

*5 grams of this sulfur were intended to allow for the sulfur retained in combination with the litharge.

pended in it. Thus, for instance, if Prussian-blue be incorporated with the solution to form a paint and this be applied to fresh concrete kept moist by standing in a tray of water the soluble alkali from the concrete penetrates the layer of Prussian-blue paint without discharging the color of the latter. That penetration has taken place is indicated by the discharge of the color of an ordinary Prussian-blue paint in an oil medium painted on the surface of the original layer. Thus if gelling could be prevented the material could be made useful as a "breathing" alkali-resistant coat for plaster or concrete.

A method of gel prevention has been found by the incorporation of coumarone resin in the solution. This resin can be added before or after chlorination. Excess, that is, more than 50%, will form a sealing medium and not a breathing one. It is possible to add as much as twice the quantity of rubbone and still obtain a "breathing" medium in spite of the sealing action of coumarone when used alone.

The phenomenon just mentioned does not appear to be one admitting of a simple explanation. Clearly the film is of a permeable or semi-permeable kind in those cases where "breathing" is experienced. Nevertheless the pigment particles dispersed in the film are protected as shown by the fact that the color is not discharged. There is some evidence that the concentration of alkali has some effect on the result. In one experiment, for example, carried out on cardboard and not concrete, the product acted as a "breather" to 5% and 10% caustic soda solution and as a "sealer" to a 2½% solution. There is thus a possibility that a different behavior may be experienced with different concrete and even with different parts of a single block of concrete.

It is possible to manufacture the hydrochloride direct from a rubbone-paper mix prepared as already described for the manufacture of rubbone. If this is crumbed and mixed in a ball mill with the requisite quantity of concentrated hydrochloric acid and then air-dried the rubbone hydrochloride can be extracted quite readily. The material prepared in this way does not gel quite so rapidly as that prepared by passing the dry gas through the solution but it forms a weak gel in time.

Chlorinated rubbone:—If dry chlorine is passed through a cooled solution of rubbone in an inert medium such as a chlorinated hydrocarbon some substitution takes place with the evolution of hydrogen chloride. This offers some evidence that the molecule is cyclized and no longer in the form of a long chain. The product is a tacky gum, very different therefore from chlorinated rubber, and dries when pigmented with a glossy finish.

A product may be prepared by milling the above-mentioned rubbone-paper mix with or without fillers with a halogen carrier such as bleaching powder. This behaves in a similar manner to that prepared by direct chlorination of rubbone but it is not yet known whether the two products are identical. The formation of a hypochlorite is possible and is being further investigated. It has not been found possible to chlorinate rubbone by this method to the same degree as by direct chlorination. The degree of chlorination has been found to be of some importance and also the particular resin chlorinated. If the chlorine content is below 50% full pigment protection is not obtained although the film acts as a "breather."

For this reason the method of manufacture utilizing bleaching powder is not very attractive since the highest degree of chlorination so far obtained in this way is only 12%. The three resins differ as follows. Rubbone *A* chlorinated to above 50% acts as a "breather" even when mixed with coumarone resin. Rubbone *B* chlorinated to a similar extent acts as a "sealer," and rubbone *C* also acts as a "sealer" but is not so effective as a pigment protector. It is interesting to note that the chlorinated rubbone *C* gives solutions of lower viscosity than solutions of the same concentration of the other resins. The influence of this on pigment protection in relation to brushing out and irregularities of surface may be of importance.

The chlorination products of rubbone are much more stable than the hydrochloride. The tacky film formed by evaporation can be rendered free from tack by incorporating pigments and mixing with chlorinated rubber or coumarone, with which it is compatible. Films formed by this combination are bright and clear, somewhat brittle, resistant to alkali and to abrasion.

Chlorination may conveniently be applied to mixtures of rubbone and coumarone in solvent naphtha. Chlorination of the solvent takes place simultaneously but to a rather less degree as shown by tests in which a solution of 25% of rubbone in solvent naphtha was added to an equal part of a 50% solution of coumarone in the same solvent, with the following results:

Chlorine on separated gum	*Chlorine in solvent*	*Ratio*
%	%	
14.7	6.8	2.2
24.5	11.3	2.2
40.5	29.7	1.4
44.2	29.4	1.5

The chlorination of the solvent was probably approaching completion at about 30% under the conditions prevailing.

Summary

(1) The methods of making rubbone are described and data given regarding the "dry" method in which rubber containing catalyst is milled with cellulosic materials and fillers.

(2) The properties of rubbone are described, including the polymerized products, the resistance of films to weak acids as for lacquering tins, and the electrical properties.

(3) Rubbone can be vulcanized with sulfur. The products have applications as cements.

(4) The method of preparation and properties of the hydrochloride and chlorinated rubbone and their use as a basis for alkali-resistant paints are described. These products have a tendency to gel, but this may be prevented by the incorporation of coumarone.

REFERENCES

(1) *J.S.C.I.*, **44**, 125T (1935).
(2) *Trans. Inst. Rubber Ind.*, **11**, 182 (1935).
(3) B.P. 417,912.
(4) B.P. 462,613.
(5) B.P. 462,627.
(6) Dept. Sci. Ind. Res., Food Invest. Spec. Rept. No. 4.
(7) *Elect. Rev.*, July 30, 1937.

Skellysolve-R Naphtha

THE latest addition to the line of rubber solvent naphthas marketed by the Skelly Oil Company, Chicago, is Skellysolve-R. The new addition is said to be a "regular" rubber solvent naphtha of extra good quality and high initial boiling point combined with low end point. Its boiling range is from 128° to 266° F; Reid vapor pressure, 4.7 pounds at 100° F; specific gravity, .707 at 60° F; and A.P.I. gravity, 68.7 at 60° F. It is especially recommended for cements.

Latex Patent Decision Upheld

ON August 10, 1937, Judge C. C. Hincks, in the District Court of the United States, District of Connecticut, handed down a decision in the U. S. Rubber Co. v. Sidney Blumenthal & Co., Inc., case, in which he held that the Blumenthal company was not infringing the Gibbons patent, the Hopkinson patent invalid for want of patentable invention as to certain claims, and the Foster & Cook patent invalid for want of patentable invention as to all the claims at issue. U. S. Rubber appealed the decision. Judge Hincks' full decision was printed in our September, 1937, issue. Because of the importance of this case to the industry, we are publishing herewith the verbatim decision of the United States Circuit Court of Appeals, for the Second Circuit, handed down by Judges Manton, L. Hand and A. N. Hand, on August 4, 1938.—Editor.

UNITED STATES CIRCUIT COURT OF APPEALS
FOR THE SECOND CIRCUIT

UNITED STATES RUBBER COMPANY,
Complainant-Appellant,
AGAINST
SIDNEY BLUMENTHAL & CO., INC.,
Defendant-Appellee.

Before:
MANTON, L. HAND AND AUGUSTUS N. HAND,
Circuit Judges.

Appeal from United States District Court for the District of Connecticut.

Suit for infringement of U. S. Patent No. 1,654,167 to Gibbons, U. S. Patent No. 1,784,523 to Hopkinson, and U. S. Patent No. 1,816,574 to Foster & Cook. A decree was entered for the defendant holding the Gibbons patent not infringed, the Hopkinson patent invalid for want of patentable invention as to Claims Nos. 1, 2, 3, 4, 5, 6, 7, 12 and 13, and the Foster & Cook Patent No. 1,816,574 invalid for want of patentable invention as to all the claims at issue, to wit: Nos. 1, 2, 3, 5, 6, 7, 8, 10 and 11. From the decree the complainant appeals. Affirmed.

Gifford, Scull & Burgess, Solicitors for Complainant-Appellant; Newton A. Burgess and Henry M. Leigh, Counsel.

Daggett & Hooker, Solicitors for Defendant-Appellee; E. Clarkson Seward, W. Saxton Seward and David L. Daggett, Counsel.

AUGUSTUS N. HAND, *Circuit Judge:*

The three patents in suit relate (1) Gibbons to the process of manufacturing vulcanized rubber compositions, (2) Hopkinson to the coating of various fibrous materials with latex compositions, and (3) Foster & Cook to the application to needled pile fabric of latex compositions such as those described by Gibbons and Hopkinson.

Gibbons Patent No. 1,654,167

The patent to Gibbons is particularly for a process of vulcanization where the vulcanizing ingredient or agent is combined with latex. Gibbons' only claim reads as follows:

> "Process of manufacturing vulcanized rubber compositions which comprises the drying and vulcanization of substantially uncoagulated rubber latex containing an organic accelerator capable of effecting vulcanization at temperatures below those ordinarily employed in hot vulcanization methods."

Although Judge Hincks, who tried the case in the District Court, simply held that the Gibbons Patent was not infringed, we think it unnecessary to deal with the difficult and controversial matters involved in that conclusion because we have no doubt that the patent is invalid for lack of invention.

The Italian Patents to Bruni granted in 1919 set forth a "process for the vulcanization of rubber or of objects made of natural or synthetic gum elastic (rubber), or of any nature whatsoever." The pertinency of the reference is criticized because Bruni specifies only rubber and not latex in his patents and mentions only one class of accelerators, the dithiocarbomates, referred to by Gibbons. But latex is defined in the Hopkinson Patent in suit as "the natural salt water emulsion of rubber obtained from the rubber trees" and is described as "rubber in the form of latex" in all four examples of the Gibbons process given by him in his specification.

Bruni's Patents employ one of the classes of accelerators described by Gibbons and it is stated in the Bruni Patent No. 173,364 that one of the advantages of the Bruni process is "vulcanization at temperatures which are much lower than those customarily employed for the vulcanization in the hot, for instance, at temperatures below 100°." The temperature mentioned is according to the centigrade scale and equals 212° Fahrenheit referred to as a desirable low temperature in Examples 1 and 4 of the Gibbons Patent.

Bruni says nothing about drying, but about vulcanizing at a suitable temperature which would produce drying. Thus he does not disclose the two separate steps of first drying and then vulcanizing which complainant argues with much difficulty are the features of the Gibbons process and which the court below found were not separate but concurrent.

Judge Brewster truly said in *Vultex Corporation v. Heveatex Corporation,* 19 F. Supp. 327,330:

> "It would seem to be obvious to any chemist, endowed with a reasonable knowledge of the art of vulcanizing rubber, that the cold vulcanizing process, well-known in its application to dry rubber, could likewise be applied in a process of vulcanizing of latex. This, in my opinion, would not amount to a patentable discovery."

We can see no room for Gibbons' process as a new invention after Bruni.

If, however, complainant is right and there is a distinction between Bruni and Gibbons due to its construction of the latter's claim that drying must precede and not be concurrent with vulcanization, this process was disclosed in U. S. Patent No. 1,605,649 to Curtis. That patent clearly anticipates Gibbons unless the latter carried back his invention to an earlier date than Curtis. Curtis describes a process of drying and then vulcanizing. He says:

> "As an example a piece of haircloth may be immersed in rubber latex of 25% rubber solids and containing curing ingredients embodying low temperature curing accelerators. After drying the cloth may be allowed to cure at ordinary temperatures, or the cure may be hastened by heat, but the temperature should not be raised to such a point as to injure the hair, and it has been found that temperatures from 150° to 200° F. are suitable. One means of carrying out the above is to employ latex which contains 1 part of zinc dimethyldithiocarbomate, 1 part of zinc oxide and 3 parts of sulphur on 100 parts of rubber. Haircloth impregnated with this mixture and dried will vulcanize satisfactorily overnight at 150° F. or in 2 hours at 200° F."

The failure of Curtis to claim Gibbons' invention can make no difference if he disclosed the invention in his application as he did. *Milburn Co. v. Davis, etc., Co.,* 270 U. S. 390. We are satisfied that Gibbons date of invention was not carried back of his filing date which was six months later than that of the Curtis application. This is in accordance with the express finding of the court below. Gibbons testified that the best description of his process in his note book is on page 45. It indicates that September 9, 1919, he impregnated cotton fiber with latex, that the fabric was dried overnight and then vacuum dried one-half hour at 40 pounds steam pressure, i.e., at 287°. This temperature was far above 240° which was shown by complainant's expert to be the low limit of hot vulcanization.

In another test the same day Gibbons vulcanized at a temperature of 286° F. On September 19 the notebook refers to

a temperature of 230° F., and on November 11 of 220°. On the earlier date the entry states that the mix "did not cure well" and, on November 20, that paper dipped in latex and cured in hot air "did not appear very interesting." Moreover, on September 16, the notebook reads:

> "On account of the property of curing at low temps possessed by above it was decided to use a different latex mix which would not vulcanize at say 212—thus enabling us to dry at 212°."

It is evident from the foregoing that Gibbons regarded curing at low temperatures as unsuccessful and that he never produced a useful article cured at such temperatures—in other words, that his experiments along that line were failures and for an indefinite period were abandoned. Indeed, his main effort seems to have been to satisfactorily impregnate the fibers of his textiles with latex rather than to vulcanize at low temperatures. There is no satisfactory proof that he ever reduced his invention to practice before the date of the application for his patent.

Moreover, the fact that for more than four years after September, 1919, when he claims to have made his invention, he filed no application to obtain a patent for his process convinces us that he did not make the invention in 1919 and is entitled to no date earlier than that of his application. It is quite impossible to carry back an invention by any such inconclusive proof as Gibbons has furnished when the burden of antedating an application is so heavy. We hold that in view of the Curtis Patent the Gibbons Patent is void for lack of invention.

Hopkinson Patent No. 1,784,523

Various claims of the Hopkinson Patent are in issue but Claim 2 is sufficiently illustrative, which reads as follows:

> "The method of making rubberized articles of fibrous material which comprises superficially coating normally penetrable fibrous material with a thickened and compounded water emulsion of rubber without substantial penetration of the material, and drying, thereby attaining a minimum loss of flexibility."

The patentee calls attention to the fact that in certain articles of manufacture such as rubber tires great strength is obtained by impregnation and the loss of flexibility is not objectionable. But he goes on to say that in other articles such as water-proofed clothing, rubberized fabric, gloves, bathing shoes and light overshoes impregnation and loss of flexibility are highly objectionable. He says that by using a thickened latex for the coating it may be applied without a substantial penetration of the fibrous material and that in all cases the consistency of the compound should be such that substantial penetration will not occur. He adds that he employs approximately 50% of solid content in his mixture, gives several formulae for compounding it, and sets out the coating and vulcanizing process. Finally he says that his process secures a strong bond between the coating and material without substantial penetration of the fabric.

Hopkinson's thought was to employ a latex compound sufficiently thick to avoid much penetration and sufficiently thin to secure a strong bond. Morisse in "Le Latex" published in 1908 showed that a thick latex would not penetrate fabric sufficiently for his purpose, which was for making automobile tires that would not blow out as a result of the loosening of the rubber from the fabric. He says:

> "At first I thought that it was necessary to use a thickened latex, namely one which had been thickened by special centrifugation. The rubber 'cream' thus obtained was spread on the fabric like a sort of shoe polish and the fabric was set aside so that evaporation could take place. This process is not at all practical. As a matter of fact, the rubber does not sufficiently penetrate the fabric; it separates easily and it therefore does not adhere well."

As we have already noted, Hopkinson himself stated in his specification that penetration of the latex compound is necessary for making strong tires. Morisse fully understood and in his publication disclosed the fact that latex will penetrate fabrics but that concentrated latex will not do this to any substantial extent. In the French Patent of 1909, No. 398,705, reference is made to mixtures of latex prepared under patents of Morisse having a proportion of 40% gelatine and 60% Hevea latex. It teaches that this mixture when vulcanized will make an "elastic sheet." It is true that nothing is said about how to apply the compound or to avoid penetration, but the instruction as to how to make a thickened mixture and the result claimed to follow would seem to indicate that the French patentee was doing much the same thing that Hopkinson's Patent discloses.

Manufacture under the British Patent to Hancock and Silver A. D. 1864, No. 3110, is said to produce "flexible elastic waterproof articles." That patent discloses a process similar to Hopkinson's for making a latex compound for the manufacture of "flexible elastic waterproof articles." U. S. Patent No. 1,523,821 to McGavack also describes concentrating latex to a percentage of 65% solids. The compound was for coating fabrics and might be applied in the way described by Hopkinson.

It seems evident that the desirability of having the latex compound penetrate the fabric deeply or not substantially depends on the nature of the fabric or the use to which the product is to be put. In view of the general state of the art it seems reasonable to suppose that the idea of Hopkinson has for years been in the minds of men manufacturing rubber coatings. Certainly Morisse understood it when he found a thick solution of rubber inapplicable to tires where a maximum of penetration is necessary to prevent them from blowing out. He must have known that a considerable concentration would furnish a superficial coating that would afford flexibility and that it could be made thin enough to make a good bond.

The difficulty is in compounding the right mixture for a given fabric. It is a purely practical and not a theoretical difficulty which must be solved by the ordinary skill of the artisan exercised through trial and error. In other words, to avoid bulk and stiffness, and to obtain a light flexible article, he will concentrate such a compound for coating as will afford a satisfactory bond. We agree with the court below that the Hopkinson Patent is invalid for lack of invention.

Foster & Cook Patent No. 1,816,574

This patent follows Hopkinson and adds nothing to his process beyond applying it to a fabric in which strands instead of being woven into the base are loosely needled in. While it is true that the purpose of the Hopkinson process was to waterproof the fabric and that of Foster and Cook to anchor the piles to the base, the latter process was merely a new use of Hopkinson's process and the application of it to anchoring piles required no inventive thought. Moreover, U. S. Patent No. 2,007,078 to Crabtree discloses a process for anchoring "the pile into the ground or back of the cloth by means of a cementitious or viscous coating, for example, a cellulous compound such as pyroxylin."

The fact that Crabtree suggested "pyroxylin" is unimportant, even if another compound would have been better, for later he said that the coating might also be a "rubber composition" which would include the prior compound of Gibbons or Hopkinson. Nor is it important that in his original application he spoke of stiffening his material so that it would be unnecessary to use cardboard for automobile linings since he spoke elsewhere in that application of applying "a thin layer of the coating." But even if Crabtree only intended to anchor the piles by a stiff layer of rubber instead of one that was flexible it certainly was no invention to use the compound and method of anchorage of Hopkinson in place of the stiffer anchorage of Crabtree for coating the pile fabric of the Crabtree Patent.

The decree is affirmed.

New "Dry Coating" for Paper

A NEW method for "dry coating" paper, consisting of the application of glossy or dull, smooth finishes to paper by means of a molten mixture of synthetic resins, waxes, crepe rubber, and other coating materials, has been perfected by Bert C. Miller, according to a recent issue of *Solvent News*. In the process, shredded crepe rubber is dissolved in a wax heated to its melting temperature, synthetic resin and other ingredients, depending on the finish desired, then being added to the mixture.

Neoprene in Fruit Washing Machine

CONDITIONS so severe that they rapidly destroy non-ferrous metals especially alloyed for corrosion resistance are not encountered very frequently. But, when a product must operate under these conditions, the designer is faced with a problem which requires a great deal of time and study.

A situation of this kind was recently encountered by the manufacturer of a machine for washing fruit.

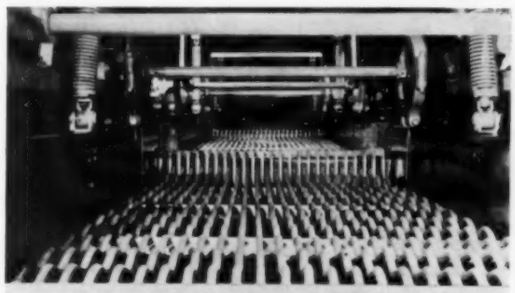


Fig. 1 (Top)—Grid of the washing machine.
Fig. 2 (Bottom)—Slipping tubing over rod.

The machine (Fig. 1) consists of a grid actuated by eccentrics in such a manner that it moves forward above and returns below the surface of a washing solution contained tank. The fruit fed onto the grid at one end of the tank and the movement plus the restraining action of the solution causes the fruit to move to the opposite end where it is deposited on a lattice-like step which is always in mesh with the grid. In case the fruit does not roll off this step into the next tank or into the drier it is pushed off by the next revolution of the grid.

When the Fruit Packers Supply & Equipment Co., Yakima, Wash., first built this type of washer they used a non-ferrous metal which had been quite successful in resisting corrosion. However, the severe conditions to which the grids were subjected caused the metal to deteriorate very rapidly. They are subjected to various solutions of soda ash, sodium silicate, muriatic acid, light mineral oils, and various types of wetting agents. The rate of corrosion is accelerated by heat and excessive aeration present in the operation.

Last year, the manufacturer conceived the idea of making the grid out of 5/16-inch cold rolled steel covered with a tube of neoprene and sealed at each end with a plug of the same material. Fig. 2 shows the operation of slipping the tubing over the rod previously bent to the desired shape. These rods, of course, could not be welded to a frame-work in the same way the all metal grid was assembled; therefore, they were mounted between blocks of Eastern maple cut and curved to fit the covered rods and held together by a rod of ½-inch monel metal. These tie rods extended through the wooden sides of the grid to give a substantial construction. There is no possibility of corrosion of the tie rods as they are entirely covered by the blocks except for the threaded ends. Several machines with this type of grid construction were in constant use all last season. The neoprene tubing is said to have given perfect protection against corrosion of the steel ends, and shows no signs of deterioration. Its use in this fruit washer solved a problem which seemed almost impossible of solution.

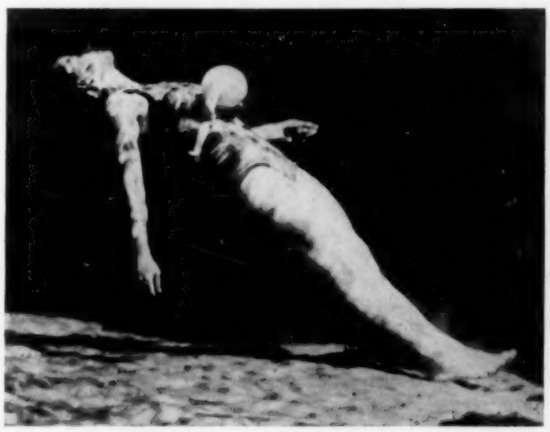
Flexible Shellac and Casein

FLEXIBLE shellac and casein, called Flexilac and Protoflex, respectively, have been developed by Glyco Products Co., Inc., New York City. The flexible shellac is an orange-colored, non-inflammable, viscous resin which dries quickly to give a flexible glossy adhesive film which is water-soluble but not affected by hydrocarbons. Because of this characteristic, Glyco recommends its use in cements for gaskets exposed to gasoline, naphtha, etc., as well as in special adhesives, latex, sizings, water-varnish, and for finishing metal, paper, straw, rubber, etc.

Protoflex—the flexible casein—is a straw-colored, transparent jelly which dissolves rapidly in water (without heat). It, too, dries rapidly to give a flexible, almost colorless, transparent film. No alkalies or solvents are needed. It has a pleasant odor, and will keep indefinitely without spoilage and is free from solid particles. It may be used for the same applications recommended for the flexible shellac. Flexilac, incidentally, may also be used as a suspending agent for pigments for coloring and glazing china, porcelain and glass.

"Lyf-Boy" Safety Unit

AN interesting life-saving device incorporating the use of rubber was recently developed by Collord, Inc., of Detroit, Michigan, for Clarence V. McGuire, an inventor. Known as "Lyf-Boy", the device is a six-ounce, ten-inch long rubber unit, mounted on a sturdy web belt with a quick-fastening buckle. Slight pressure on one end of the rubber unit produces an instantaneous combination of harmless gas-producing chemicals which inflates the unit. The resulting gas



gives the inflated unit sufficient lifting power to float a person, face up and out of water, for at least sixteen hours. The use of "Lyf-Boy", which should be worn on the front of the body, not higher than the chest nor lower than the waist line, does not hinder the movements of the wearer, according to Collord.

Charles Goodyear

CONNECTICUT YANKEE AND RUBBER PIONEER*

By P. W. Barker

CHAPTER VI.

Goodyear Meets John Haskins and Nathaniel Hayward

WHEN business conditions were at their worst, Charles Goodyear met, on a visit to New York from Staten Island, John Haskins, of Roxbury, one of the original stockholders of the Roxbury India Rubber Factory. Place of meeting was the local store of the company, and time was spring or early summer of 1837. Goodyear had the gift of friendship which was to bind John Haskins to him for many years. Samples of rubber goods treated by the acid gas method appealed to Haskins; accordingly, Goodyear was invited to visit the factory of the company in Roxbury, Mass.

Goodyear Visits Roxbury

In some manner the necessary funds were obtained for Goodyear to make the trip to Roxbury in the fall of 1837. True to his promise given in New York, Haskins arranged with Samuel T. Armstrong, president and manager, to assist Goodyear in every way possible. A portion of the plant was given him for experimental purposes, as well as a drawing-account, and William F. Ely was hired to assist him. Considerable quantities of sheet rubber and rubberized cloth were run and treated by the nitric acid process.

In several months Goodyear made many beautiful articles of sheet rubber, such as piano and table covers and ladies' capes, some of the latter being handsomely painted with gold and silver borders. Everyone acclaimed the beauty of these goods. Newspapers were printed on rubber sheets. Goodyear, and practically everybody else, thought that the cure was complete, and little did he suspect that it was only a partial, surface cure. An order for a large number of mail bags (about one hundred and fifty) was prepared for the Government. But with the return of warm weather, it was the old story over again. The beautiful drab colored goods soon decomposed and became sticky.

Goodyear's account with the company had been drawn on for two or three thousand dollars; therefore, Armstrong asked him to discontinue experiments. This was in the spring of 1838. Haskins could do nothing; the company was practically bankrupt. Goodyear just had to go.

(*) A continuation of the biography of Charles Goodyear. The introduction and first chapter appeared in the April, 1938, issue.

Retaining his faith in the acid gas process, and undoubtedly needing cash, Goodyear sold licenses to manufacture shoes by a newly patented method, together with the privilege of curing by the acid gas process. It was still his sincere belief that his process was effective for thin rubber sheets and rubberized fabrics of slight thickness. The new patent was U.S.P. No. 849, July 24, 1838,—"Improvement in the Manufacture of Gum-Elastic Shoes."

Licensees were J. W. Clark, of Boston, and Charles Jackson, of Providence, who were succeeded in Providence by Isaac Hartshorn and Company. In the summer of 1838, additional licenses were sold to Luke Baldwin and John Haskins, for the manufacture of piano and table covers, to be made at Lynn, and to Luther Clark, of Northampton, for the manufacture of carriage cloths. Method of curing in all these licenses was the acid gas method used in connection with solarizing.

Goodyear had met Nathaniel Hayward casually at the plant of the Roxbury company sometime in 1838; but in the summer of the same year the acquaintanceship was renewed in a more substantial manner. Charles Goodyear and his aged father, Amasa, were riding in a horse-drawn chaise. They had driven to Woburn to make an offer to purchase the rubber manufacturing plant operated by Hayward. Terms were not agreed upon, and Hayward would not permit them to inspect his plant. A few weeks later Hayward and Goodyear met again, this time by accident on Water Street, in Boston. Pleasantries were passed, and Hayward complimented Goodyear on the excellence of his printed rubber fabrics.

Some strange force of common destiny was drawing these two men together. From Hayward, Charles Goodyear was to learn of the use of sulfur in rubber manufacture—half the problem of vulcanization would then be solved.

Nathaniel Manley Hayward

Nathaniel Manley Hayward was born on January 19, 1807, at South Easton, Mass., and moved to Boston as a youth. Married Louisa Buker with whom he had seven children. He had but small formal education, if he may be judged by some poorly spelled letters he wrote. Nevertheless, Hayward had a keen

mechanical mind and a patience for detail, two important qualities necessary to rubber manufacture and experimentation.

Hayward's Interest in Rubber

At the time of his first interest in rubber, 1833, Hayward operated a livery stable and carriage shop, on Federal Street, in Boston. This was at the beginning of the rubber boom in New England and at the time the Roxbury India Rubber Factory was seeking purchasers of their stock as well as for their rubber goods. Hayward later claimed that President Andrew Jackson's appearance in Boston in June of 1833 (he incorrectly says 1834) clothed in rubber garments, stimulated the public interest, and his own, in the new industry. Hayward made several statements concerning his early interest in rubber, but the Jackson story did not appear until 1864. It has already been shown that Hayward must have been mistaken regarding this matter.

First experiments were conducted by Hayward in his carriage shop in Boston, August, 1834—turpentine and gum spread on cloth in imitation of a carriage cloth he had purchased. These experiments were continued for six or eight months. He disposed of his livery business, obtaining $500 and a horse and buggy, and moved to Easton. Here he rented a mill (called Quaker Leonard Place) from Cyrus Lathrop for $150 a year. The mill was in a quiet spot, a mile from the main road, and here he first manufactured rubber articles for sale in the summer of 1835. Equipment included one mill, one spreading or knife machine, and one churning machine. Name of the concern was the Eagle Company and capital, in addition to the experience, skill and hand-made machines of Hayward, was only $100 furnished by Albert and Jacob Richardson, Samuel Sweetser, and O. B. Coolidge for continuation of Hayward's experiments.

Early in 1836 the Eagle India Rubber Company was organized around Hayward's old company by Jacob Richardson, Samuel Sweetser, Edward Haynes, Jr., John Bigelow, O. B. Coolidge, Nathaniel Hayward, Timothy Newell, P. B. Hovey, and others. Hayward obtained stock and was placed in charge at $1,000 a year. Business was carried on in Easton for about six months (September, 1835 to March, 1836) with 7 men and 20 women employees. A more conveniently located and better building (called Hill's Mill) was obtained in Woburn and the factory moved to the new quarters. Original charter for the company had been obtained November 13, 1835, at Woburn, Mass., for $30,000, although no more than $15,000 was ever actually paid into the company. Products were household aprons, brickers or aprons for brick-making, carriage cloth, life preservers, caps, and hats. Shoes were first made of the new company's cloth in March of 1836.

Operation of Eagle Company

O. B. Coolidge, who is mentioned by Goodyear in his autobiography as one giving him needed assistance, was president and superintendent of the plant. Company operated for 16 or 18 months, with total sales of less than $15,000 or about the cash investment. Men's wages were $1 a day; woman's and girls', $3 or $3.50 a week; and the price of rubber in 1835 was 40 to 50 cents a pound for the shoe and bottle variety, while ordinary gum was available from 8 to 10 cents per pound.

The following bill of goods was sent on consignment to Alexander Strong, wholesale shoe and leather dealer, Washington Street, Boston, by the Eagle India Rubber Company, of Woburn, Mass. (then operated by Newell and Hayward), on November 10, 1837:

100	pairs waterproof laced shoes	$ 1.25 a pair	$125.00
8	doz. silk and satin trimmed aprons	11.00 a doz.	88.00
6	doz. misses velvet trimmed aprons	7.50 a doz.	45.00
8	doz. silk and satin trimmed aprons	11.00 a doz.	88.00
6	doz. velvet aprons	9.00 a doz.	54.00
20	doz. green aprons	10.00 a doz.	200.00
36	pairs ladies button shoes	1.37 a pair	49.32
60	pairs ladies laced shoes	1.25 a pair	75.00
			$724.32

Hayward Takes Over Plant

In July of 1837 Hayward and William S. Humphrey purchased the company and operated the Woburn plant as Hayward and Humphrey. After a month or two Timothy Newell obtained Hayward's interest and for nine or ten months operations were conducted under the style of Newell and Humphrey. On April 18, 1838, all interest appears to have been lost in the company by Newell and Humphrey, probably because of its involved finances, and after that time operations were in the name of Nathaniel Hayward. What probably happened was that Hayward took over the company for the wages owed him.

Hayward and his brother Martin made several improvements in rubber-working machinery, which were sold to their larger competitor, the Roxbury India Rubber Factory. One of these improvements was the spreading or knife machine and it might have been partly, if not entirely, the inspiration for Chaffee's "Monster" machine. Hayward's machine was much smaller, having three revolving drums between which cloth was run. The rubber mixture was placed on the rolls by means of trowels, and a scraper or knife-edged bar spread the mixture evenly on the cloth; the cloth then ran around the other roll.

It is known that John Haskins was generally acquainted with Hayward's machine, as in all probability was Edwin M. Chaffee. Other machines of Hayward were a mill, a large tub with churning blades for mixing turpentine and rubber; a churner, similar to a butter churn, for clarifying spirits of turpentine by straining through small holes; and two stills for distilling spirits of turpentine. Water power was used.

Early Solarizing Efforts

Much has been said about the early use of the sun in effecting cure or even vulcanization. Hayward has explained sun treatment with more clarity than some of his better educated collaborators. Mention has been made of the meeting of Hayward and Goodyear in Boston in the summer of 1838. Hayward complimented Goodyear at this meeting, telling the inventor that he had moved ahead of all the others in the way of manufacturing. Goodyear responded by giving Hayward a number of small samples of his rubberized fabrics.

Hayward once testified, "At the time I should think they were the handsomest goods on the market, and the best of the pure and colored goods, except the black, made at Roxbury and by myself. His samples were white, brown, some transparent, and some bronze or gilt on pure gum. I nailed them up beside some of my own black fabric in the sun and weather. Goodyear's did not last more than three or four weeks; they melted and became sticky, and wasted away with the weather."

Use of the sun, therefore, was only for testing the goods against the approach of warm weather. Goodyear and Hayward both used this means of testing, and Goodyear went further by using the heat of the stove. These tests were to give him a clue to vulcanization.

There are many stories about Hayward's first use of sulfur. In one, he used it in his Boston carriage shop in a pot of gum, together with all the other painters' ingredients he could find about the shop. He boiled this conglomeration and spread it upon cloth. Many times afterward Hayward tried to recall all the items entering this apparently successful mix. Another version has him seeing sulfur in a dream. A third story involves a walk in the Common where he saw some laborers using sulfur to set iron posts into stone foundations. Picking up a piece of the sulfur, Hayward took it to his shop for experimentation.

Regardless of the manner of discovery, Hayward believed that sulfur was helpful in rubber manufacture. Further, in testing his samples in the sun he probably effected partial vulcanization. Chaffee had used sulfur at Roxbury, but without success. High degrees of heat were still missing.

Charles Goodyear visited Hayward's plant in Woburn on several occasions in the summer of 1838. At no time did Hayward permit him to pass the front door. But on September 17, 1838, Hayward sold out his interest to Charles Goodyear and agreed to work for him for one year for a salary of $800, beginning immediately. Goodyear now had the privilege of entering his own rubber factory, and Hayward has stated that Goodyear smelled sulfur fumes on his first visit. Anyway, Hayward quotes Goodyear as saying, "Hayward, I want you to tell me if you use sulphur or not; if you have not used it, I want you to say so."

(To Be Continued)

Minralex Black No. 15

IN order to round out an already extensive range of blacks, a group of four new products which belong to the mineral black category were recently added to the line of blacks featured by the Binney & Smith Company, New York City. The new blacks are described as "calcined and processed carbon bearing ores." Tests conducted by the company indicate that one of the four (Minralex Black No. 15) mixes with rubber in a perfectly satisfactory manner, acting as an inert filler of low reinforcing power.

The Minralex Blacks are produced from ore which has been especially selected from the point of view of chemical composition. They exhibit excellent color value when a comparison for intensity is made against the general run of mineral blacks. Although the color grades are not sufficiently intense to approach carbon black or bone black in jetness, the color is absolutely fast and altogether permanent since the blackness of the Minralex group is also due to the presence of elemental carbon.

As a class, the new blacks are in the very low oil absorption range, having approximately one-tenth that of an ordinary grade of carbon black. They also have a comparatively low tinting strength value, the highest grade having only about one-seventh the tinting value of an ordinary grade of carbon black. Their pH values range between 5.5 and 5.7. Minralex Black No. 15 has a fineness of 98.5% through a 325 mesh screen. The specific gravity of the blacks ranges from 2.50 to 2.68, the carbon content between 20.7 and 10.5, and the ash content from 79.3 up to 89.5.

Chemically-Modified Rubbers

INCLUDED among the research activities conducted by the Technical Research and Development of New Uses Committee of the Rubber Growers' Association, Inc., of London, during 1937, were several investigations on modified rubbers. The following data is taken from the Committee's recently rendered report covering these investigations last year:

A detailed investigation was made of the changes which occur when maleic anhydride reacts with rubber. The reagent has been shown definitely to combine with rubber, and the course of the reaction over a wide range of concentrations of the reactants was explored. The resulting products proved to be substances which in themselves have important and useful properties, but the greatest importance of the reaction was believed to lie in the capacity of the maleic anhydride to promote combination or to form links with other important classes of substances.

Sulfonated Rubber Experiments

The possibility of obtaining useful materials of considerably lower molecular magnitude than rubber by pushing the oxygen-intake of solutions of rubber as far as possible was examined. Highly oxygenated neutral and acidic materials were produced, the broad constitutional characteristics of which were determined. The degree of utility to be attributed to these substances is as yet uncertain. Attempts were also made to obtain sulfonated rubbers by treatment of rubber (in solution) and oxidized rubbers with suitable sulfonating reagents. It was found that sulfonation does not readily occur and the products resulting from the treatment were unpromising.

Further experiments with various catalysts and modification of procedure resulted in the preparation of a much improved synthetic resin containing rubber which is definitely thermo-setting and contains the rubber in chemical combination, an effect believed to be entirely novel. Patent protection for this process has been applied for. A marked reduction in production costs is seen with the use of this new resin. Tests indicated that the electrical properties of the synthetic resins containing rubber are superior to those of comparable, standard, non-rubber containing materials. Commercialization of the new resin is now being attempted.

Much detailed work was carried out on the perfecting of a semi-commercial machine for continuous production of expanded chlorinated rubber. Although many difficulties still remain it is hoped to have the machine in continuous experimental operation within the next few months. An examination of rubber chlorobenzylmethyl ether did not yield promising results from the technological point of view. Experiments with a view to linking rubber with other typical colloidal substances have been initiated.

Tests on chlorinated rubber resulted in the discovery that by feeding milled sheet, with a thickness of approximately 0.015-inch, into liquid chlorine at —40°C., rubber may be continuously chlorinated to yield a derivative containing 55% chlorine, and the time of contact is thereby reduced to 10 minutes as compared with 30 minutes under static conditions. If a rubber solvent is added before or during the chlorination, the improved contact between reagents leads to a derivative containing 61% of chlorine, especially notable for its improved stability. The derivatives obtained by the agency of liquid chlorine yield water-white solutions, from which colorless transparent films, free from haze, can be prepared.

Schulman Has Tenth Anniversary

Company Has Expanded Rapidly Since Its Organization in 1928 by Alex Schulman

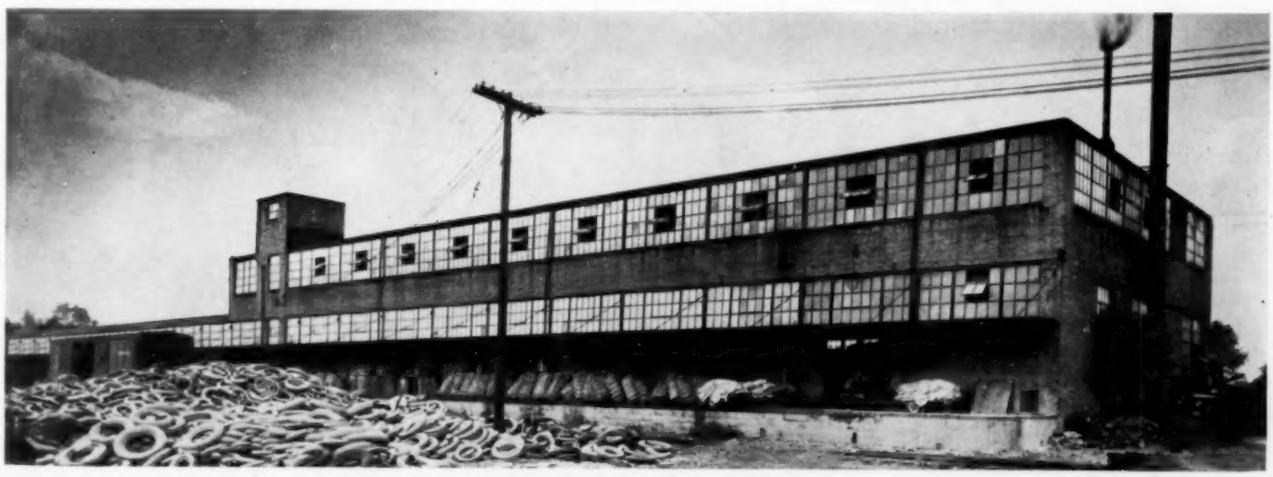
Alex Schulman, the founder and president of A. Schulman, Inc.

George Woloch, secretary and treasurer of A. Schulman, Inc.

THE firm of A. Schulman, Inc., dealer in crude rubber, scrap rubber and hard rubber dust, with headquarters in Akron, Ohio, and branch offices in Boston, Mass., and East St. Louis, Illinois, celebrates its tenth anniversary this month. Ten years ago Alex Schulman, who had spent the twelve previous years in building up his knowledge of the crude and scrap rubber market, founded the organization which bears his name and which he still heads. George Woloch, then a junior at Harvard, was persuaded to drop his studies and become secretary and treasurer of the new firm, while Doris Kushkin, who had spent three years on office detail for various rubber manufacturers, was named office manager. These three formed the nucleus of what is now one of the leading scrap rubber organizations of the world.

A. Schulman, Inc., started operations in a small warehouse in Akron. Mr. Schulman laid down three rigid regulations for himself and his associates to follow: (1) absolute uniformity in filling orders, (2) exacting standards in shipments, and (3) rapid deliveries. Strict adherence to these standards soon attracted sufficient business to warrant expansion. An office was opened in East St. Louis and Milton Kushkin was named branch manager. He is now rounding out nine years of service with the company.

Later it was found necessary to increase the Akron facilities and consequently A. Schulman, Inc., moved into a new combination plant and executive offices. The new plant is considered to be one of the finest scrap rubber warehouses in the country. It has siding facilities on both sides of the building so that sixteen freight cars can be handled at one time if necessary. Still later, due to further expansion and a desire to maintain closer contact with customers in the New England territory, it became necessary to open an office in Boston. Dave Lundquist, a native of Bridgeport, Conn., was sent to



The siding facilities at the Schulman warehouse in Akron permit sixteen freight cars to be handled at one time if necessary.

the new office as branch manager. He had been with the Akron office for a number of years prior to being sent to Boston.

During the years of constant progress and expanding sales, it was necessary to increase the Akron staff. Accordingly, John J. Costello, with eighteen years of experience in the scrap rubber business, was brought into the organization. Samuel A. Tanney, with twelve years of experience in handling scrap rubber problems, next joined the company. Ben Gordon was another addition, and since joining the company has been placed in charge of purchases of scrap tires and tubes for use by reclaimers.

Irving Schulman, after being graduated from the Wharton School of Business, became a junior salesman. Frank Francis was added to the staff at the East St. Louis office and became a valuable assistant to Mr. Kushkin. James Christopher, a graduate of Brown University, is using his former experience as a rubber chemist in aiding the company's customers to iron out their compounding problems.

Its tenth anniversary finds the firm of A. Schulman, Inc., buying and selling crude rubber, scrap rubber, and hard rubber dust throughout the world. Orders are shipped to all parts of the United States, as well as to England, France, Asia, China, Japan, South America, and other countries. All grades of scrap rubber are handled by the company. And behind all of this activity there is still the guiding hand of Alex Schulman, founder and president of A. Schulman, Inc.

Rubber Tape Specifications

BECAUSE rubber insulating tape is extremely important to the electrician or other workman charged with the responsibility of properly insulating joints in electrical wires and cables, the American Society for Testing Materials has given considerable attention to such tape in recent years, special investigations resulting in a new Rubber Tape Specification (A.S.T.M. D119-35T). The reasons behind these investigations and an explanation of the specifications were given by W. H. S. Youry, of the Bell Telephone Laboratories, in a recent issue of *Industrial Standardization*. Mr. Youry is Chairman of Subcommittee IX on Insulating Tape of the A.S.T.M. Committee D-11 on Rubber Products.

Tensile Strength and Elongation

Due to the fact that rubber tape is used extensively to wrap joints in rubber-covered wire, it needs to have handling qualities which facilitate application as a relatively smooth and not too bulky built-in-place rubber insulation. Consequently, a material which will stretch and not break under the normal strain of wrapping is highly desirable. In the American Standard tensile strength and elongation, measured on the well known dumb-bell-shaped specimen of the ½ inch by 2 inch size in the constricted area, are limited to not less than 250 pounds per square inch and 300 per cent, respectively.

It is also important that there be no unwinding of the rubber tape while the workman is getting ready to bind down with friction tape. For this reason a tackiness requirement has been incorporated in the specification which prohibits any tape having a tendency to unwind immediately following its windup on a mandrel at 200 per cent or more elongation and under a stipulated load.

The minimum dielectric strength of this material is 350 volts per mil of thickness when tested under an electrode pressure of one pound per square inch by a 60-cycle alternating-current voltage of practically sine wave form. This test is made with the tape placed between two flat electrodes having an area of contact with the surfaces of the tape of exactly ¼ inch in width by 4 inches in length.

As rubber tape is always stretched in use, the fusion test in accordance with the American Standard, as is also the case in the tackiness test, is made with the tape elongated. It is determined by the use of a free-turning ¼-inch mandrel mounted in ball bearings. A test strip of tape 7 inches in length is firmly secured to the mandrel by the first two inches; then a weight of 4 pounds per inch of width is attached to the specimen and the tape is accordingly elongated.

Additional Force Applied by Hand

If the weight is insufficient to elongate the tape 200 per cent or more, additional force is applied by hand to elongate the material 200 per cent. The tape is then wound up on the mandrel at a uniform rate, and is allowed to stand 3 minutes with the weight attached. After this, with the weight still attached, it is allowed to unwind slowly. The mandrel shall revolve not more than 2½ turns in the first two minutes, during which time the tape shall sustain the weight or shall break at the point of unwinding.

As there is need for both narrow and wide tape, several sizes of rolls have been provided for. Widths of ¾ inch and 2 inches are available, but nominal lengths are limited to 30 feet because anything larger would be too bulky for easy handling. Each roll is individually packaged in a suitable box, properly identified as to its contents and the manufacturer, in order to prevent any injury during normal handling and shipping. Each roll has a separator in the form of a parchment paper or glazed sheeting between the adjacent convolutions of the rubber; otherwise the tape could not be unwrapped without tearing or stretching it.

The inspection of this material is of a destructive nature and the cost of such inspection on each individual roll would be far greater than the value of the tape involved. In recognition of these facts the American Standard goes so far as to set up a sampling inspection, in which the number of rolls to be looked at is determined by the number of rolls submitted at any one time. It is believed that this procedure of checking a limited number of rolls picked at random should assure the acceptance of only that tape which in general meets all the requirements of the specifications.

Latex in Ceramic Use

LATEX can be successfully used in the manufacture of thin-walled china, porcelain, and other ceramic pottery, according to a patent (U.S.P. 2121018) recently granted to Mitchell Carter and Gustav Heinz of Trenton, N. J. Used as a binder, latex reduces the amount of clay normally required for manufacturing such ceramic material. In the production of thin-walled vases it acts as a stiffening agent, preventing collapse and distortion of the plastic mass prior to hardening. According to the patent, the latex is mixed in with the ingredients, the percentage being one part latex to ten parts of the mix; the formed pottery is then placed in the firing oven; and the latex is burned out when the heat hardens the ware into its final form.

New Equipment

Vari-Pitch Speed Changer

INCORPORATING many new improvements, the Vari-Pitch Speed Changer has been added to the line of variable speed transmission units produced by the Allis-Chalmers Manufacturing Co., Milwaukee, Wisconsin. The new unit has been made available in a range of ratings from .6 h.p. at minimum output speed of 360 r.p.m. in one unit having a constant

speed drive at 700 r.p.m., to 33 h.p. at maximum output speed of 2,160 r.p.m. with a constant speed input at 1,200 r.p.m. Maximum speed corresponding to the minimum of 360 r.p.m. is 1,355 r.p.m., with a corresponding recommended output of 1.3 h.p., and corresponding minimum speed available on the 1,200 r.p.m. input unit is 665 r.p.m. for a recommended output of 23.1 h.p. Two parallel shafts riding on anti-friction bearings are mounted inside the housing, with their shaft ends extending on both sides of the housing so that input and output can be connected at either end of the unit, on either side, or on alternate sides. A control shaft is used to adjust the effective pitch diameters of the sheaves. On the same side of the housing as the control shaft is a scale and pointer which indicate output speed. The shaft can be operated by means of a handwheel or a power drive can be applied for automatic control. The accompanying illustration shows a demonstration assembly of the Vari-Pitch Speed Changer, with the transmission cover removed.

Palmer-Bee Roller Conveyors

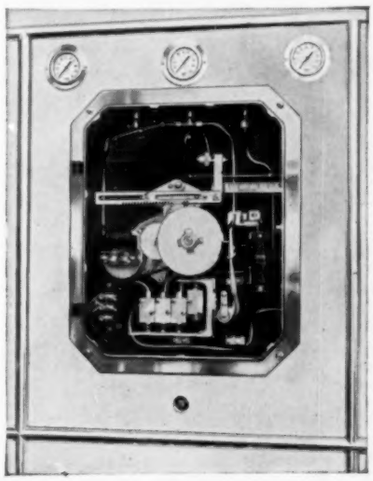
AN entirely new line of roller conveyors has been introduced by the Palmer-Bee Company, Detroit, Mich. Three types of bearing are employed: commercial ball, with capacities from 60 to 4,500 pounds per roller; precision tapered roller, from 1,000 to 12,000 pounds per roller; and precision ball, from 1,000 to 8,000 pounds per roller. Conveyors are gravity or power driven. A balanced design is claimed, *i.e.*, the tube, bearings and frame rail are of proportionate capacity, thus eliminating the possibility of early breakdown in any one of these three major parts. Rollers range from 1 to 4½ inches in diameter in one line to 2⅛ to 7⅝ inches in diameter in another. Ten foot lengths are standard, but other lengths to suit requirements can be furnished.

Banbury with Two-Speed Motor

A NEW Banbury mixer, equipped with a two-speed motor so that the machine can be driven at the usual standard speed and at double the standard speed if desired, has been introduced by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Recent tests are said to have indicated that the Banbury does an excellent job of breaking down rubber when operated at double speed, and does it more efficiently than at the slower standard speed. When running at double speed the rubber gets much hotter than at standard speed, but the temperature can be controlled largely by regulating the amount of cooling water. According to Farrel-Birmingham, it is now common practice to break down rubber at higher temperatures than were permissible a few years ago. It has also been found good practice to mix some classes of rubber compounds, such as masterbatches of rubber and carbon black, at higher temperatures than formerly used. When the Banbury mixer is used for mixing or breaking down rubber at high temperatures the ample cooling facilities provided in the machine are not needed. The thermocouples built into the modern Banbury are said to be more sensitive than the thermometers used on earlier mixers and consequently provide a more reliable guide to the actual temperature of the stock in the machine.

Automatic "Bumping" of Platen Presses

IN the molding of mechanical rubber goods, such as golf balls, rubber heels, drive belts, etc., as well as in the molding of plastics, one of the sources of flaws is the trapping of air or gas bubbles which form pits or pock marks on the surface of the finished product. "Bumping" or "cracking" of the platen press, during which the press is slightly and momentarily opened several times at the beginning or near the end of the curing cycle, depending on the product being vulcanized, generally prevents these flaws from occurring. "Bumping" has been a manual operation to



date. Now the Taylor Instrument Companies, Rochester, N. Y., has perfected a method of automatic "bumping" which is an auxiliary function of the company's standard adjustable and fixed-cam types of pneumatic time-cycle controllers. With this new feature, either type of Taylor timer will "bump" the press at the start of the curing period or at some later interval as required. The duration of the bumping period is said to be readily adapted to the ram speed of the press by an adjustable sector of the cam. As

perfected by Taylor, the bumping operation is independent of both time and press-ram travel, bumping taking place only when the ram pressure has built up to a pre-determined value which is sufficient to drive the entrapped air or gas to the surface of the product where it can escape when the press is "cracked." The following advantages are claimed for the automatic bumping feature: maximum bumping efficiency is assured; pock marks and pitting are reduced to a minimum; excessive opening of the press and consequent dislodging and injury to the product are eliminated; the "human element" is removed; the operator's time is saved, permitting him to tend more presses or perform other duties.

Palo-Travis Particle Sizer

DESIGNED for use by operatives in actual plant control, the Palo-Travis Particle Sizer is being marketed by Colloid Equipment Co., Inc., 50 Church St., New York City. The new apparatus operates on the principle that dispersed particles of dimensions exceeding the colloidal in a confined fluid medium tend to settle under the force of gravity and the rate of sedimentation proves the means of measuring particle size; therefore, it suffices to measure accurately the rate of sedimentation. Particle sizes below 44 microns may be analyzed. Large samples are unnecessary, accurate results being attained in about two hours from representative samples of less than 5 grams. The Palo-Travis Particle Sizer consists of a large glass tube mounted on an oak support. The tube gives a height of fall slightly over 1 meter. A mixing chamber, to hold the sample, is separated from the large tube by a stop-cock with a large accurate bore to facilitate settling of the material. A sedimentation measuring tube, flat-bottomed and graduated in millimeters, is supported by a rubber stopper at the base of the large

tube. A micrometer eye-piece, mounted to the left of the sedimentation measuring tube, enables the operator to read sediment heights in fractions of a millimeter. At the right of the sedimentation measuring tube there is a small electric tapper and an illuminating unit to simplify readings. An electric stop-clock is supplied on all instruments used on 110 volts, alternating current, 60 cycles. Instruments operated on other currents are equipped with stop-watches. The new particle sizer is said to feature simplicity of design, speed and ease of manipulation, and low initial cost.

Booklets, Catalogs, etc.

Rubber Statistics—1900-1937. Compiled by P. W. Barker. Bureau of Foreign & Domestic Commerce, Washington, D. C. 6x9 in. 10c per copy (For sale by Superintendent of Documents, Washington, D. C.).

For the first time all the basic statistical data necessary to a study of the development of the rubber manufacturing industry from 1900 to 1937 has been made available between two covers. Production, absorption, stocks and prices of crude rubber are covered, with the data on prices going beyond 1900. Official annual and monthly trade returns of the countries producing or consuming rubber were the source of practically all of the statistics given. The manner of presentation is: (1) short preliminary statement; (2) annual statistics, 1900 to 1937; (3) monthly statistics for the last twelve years. Only brief textual matter accompanies each major subdivision of the text, each table telling its own statistical story. The all-inclusive statistical booklet was prepared under the direction of E. G. Holt, acting chief of the Leather and Rubber Division of the Bureau of Foreign & Domestic Commerce.

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The Effect of Rubber Upon Some Properties of Asphaltic Bitumen. By J. M. Van Rooijen. The Rubber Stichting, 182 Heerengracht, Amsterdam, Holland. 6¼x9½ in. 28 pp. (A limited number of copies available from THE RUBBER AGE).

Although the changes which occur in the properties of asphaltic bitumen when rubber is added have been mentioned in the previous literature no explanation has been offered as to why these changes take place. This booklet, a reprint of an article in a recent issue of *Materialenkennis*, contains such an explanation, and also brings forward more factual material. Methods of estimating the properties of asphaltic bitumen-rubber mixtures are also given. This booklet is available in English, French, German, and Dutch.

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Coated Fabric Compounding—Rubber and Neoprene. By A. J. Northam and S. G. Byam. (Lab. Report No. 38-7). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware. 6¼x9½ in. 26 pp.

Several formulas for rubberizing fabric and various methods of vulcanizing rubberized fabrics are given in this report. The compounding and curing of neoprene compositions for coated fabrics are also discussed. Physical test data on the various compounds are summarized and the results of bomb appearance tests are given. Comparison of a rubber stock and a neoprene stock for oil resistance is also shown.

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The Thirty-Year Decline in Commodity Prices. By Allen W. Rucker. Published by the Eddy-Rucker-Nickels Co., 1400 Massachusetts Ave., Cambridge, Mass. 6 x 9 in. 24 pp. 25c per copy.

A reprint of an address made by the author, well-known economist, before the Commodity Club of New York, this booklet traces the effect of the decline in commodity prices on the American system, and offers suggestions as to how to combat the decline so that productivity could be the pivot wheel in restoring the profit system rather than price manipulation. Mr. Rucker makes good use of charts and diagrams to prove his points.

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Goodrich Tires for Tractors and Implements. B. F. Goodrich Co., Akron, Ohio. 5¼x8¼ in. 68 pp.

The newest edition of this ready reference work for manufacturers, retailers and consumers in the tractor and implement field contains more solid statistical data than the two previous volumes. Included among other data are specifications for tractor and farm implement tires and wheels. The company's line of low pressure pneumatic tires for agricultural service is illustrated and described.

Rubber: Some Facts on Its History, Production & Manufacture. By P. W. Barker. Bureau of Foreign & Domestic Commerce, Washington, D. C. 8x10½ in. 36 pp. 5c per copy.

Furnishing general information on the production of rubber and the manufacture of rubber products, this pamphlet has been primarily prepared for school children, college students, and the general public. More attention has been given to the subject of rubber cultivation than to rubber manufacturing. The differences between "wild" and "plantation" rubber are stressed, with brief mention made of reclaimed rubber and synthetic rubber. Some statistics are also given.

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Symposium on Plastics. American Society for Testing Materials, 260 S. Broad St., Philadelphia, Penna. 6 x 9 in. 51 pp. 75c per copy.

The six papers delivered at the Symposium on Plastics sponsored by the A.S.T.M. at its March, 1938, Regional Meeting at Rochester, N. Y., together with the discussions, are contained in this booklet. Authors are A. F. Randolph (DuPont), H. M. Richardson (General Electric), W. A. Zinzow (Bakelite), C. H. Penning and L. W. A. Meyer (Tennessee-Eastman), J. C. Pitzer (Formica Insulation), and Gordon M. Kline (Bureau of Standards).

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Farrel-Sykes Gears and Gear Units. (Catalog No. 438). Farrel-Birmingham Co., Inc., Ansonia, Conn. 8½ x 11 in. 80 pp.

This catalog contains information on the various types of speed reducing and speed increasing gear units and related products manufactured by the company. Herringbone gears and their advantages are discussed and the introduction and development of the Sykes process for generating continuous herringbone teeth is told. Forty-six charts and tables are included. The catalog is well illustrated.

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Rubber in Roads. The Rubber Stichting, 182 Heerengracht, Amsterdam C, Holland. 5 x 7½ in. 32 pp.

Published on the occasion of the 8th International Road Congress, this booklet reviews the use of rubber in road construction, particularly the use of vulcanized rubber and of rubber latex or powdered rubber blended with asphaltic bitumen. A list of trial stretches of roads in Holland, together with the compositions used in each instance, is included. In addition, there is a short article on some of the technical properties of rubber.

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Stokes High Vacuum Pumps. (Catalog 38-P). F. J. Stokes Machine Co., Olney Post Office, Philadelphia, Penna. 8½ x 11 in. 28 pp.

This catalog of high vacuum pumps made by Stokes may also be considered as a hand book on vacuum practice. Five sizes of pumps, from 10 to 225 cubic feet capacity, are illustrated and described. The hand book section is replete with charts, graphs, tables and other data, much of it said to be original and hitherto unpublished.

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"If I Only Had That Book." (Catalog No. 6). Chemical Publishing Co. of N. Y., Inc., 148 Lafayette St., New York City. 5½x8½ in. 150 pp. 10c.

This latest catalog, like its predecessors, lists and describes chemical, bacteriological, pharmaceutical, medical, engineering, electrical, and general scientific and other technical books of American and British publishers. An index makes the location of any volume a simple matter.

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Miller Products. Chas E. Miller Corp., Anderson, Indiana. 8½x11 in.

This loose-leaf catalog illustrates and describes the wide variety of products and machinery featured by the company, including retreaders, camelback repair materials, tire shop equipment, etc. A history of the Miller Vulcanizer is also included. The company plans to furnish pages for inclusion in the catalog from time to time.

Accident Rates in the Rubber Industry (for 1937). National Safety Council, Inc., 20 North Wacker Drive, Chicago, Ill. 8½x11 in. 8 pp.

This analysis covers accident rates, the causes of accidents, and the types of accidents most common in the rubber industry. Charts and tables are used to illustrate the text. The analysis shows that the rubber industry ranked seventh in frequency and thirteenth in severity during 1937 in a list of 30 major industries.

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26 Interviews with Champion Farmers. Firestone Tire & Rubber Co., Akron, Ohio. 7x10 in. 72 pp.

This booklet contains reproductions of interviews with champion farmers held on the Firestone "Voice of the Farm" radio program. Various subjects of interest to farmers, from plowing to breeding cattle, are covered in the interviews, as are experiences with Firestone agricultural tires and other farm products. Firestone farm products are also illustrated and described in the booklet.

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Falk Gear Drives and Couplings. Falk Corporation, Milwaukee, Wisc. 10 x 11½ in.

We are in receipt of a new binder containing current Falk literature. The binder, of loose-leaf construction, contains a number of bulletins, separated by tabs to facilitate location, as follows: Herringbone Reducers, Right Angle Reducers, Motoreducers, Couplings, Lubrication and Maintenance, and General. The bulletins in the new binder make all older bulletins obsolete as to data furnished.

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Quality and Cost Control: Batching by Weight. (Bulletin 385). Buffalo Scale Co., Inc., Buffalo, N. Y. 8½x11 in.

The company's line of automatic batching scales, said to provide precision control of quality and cost where exact proportioning of materials is a critical operation in processing, is illustrated and described in this catalog. Features, such as electric eye and interlocking sequence controls, are stressed.

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The Text-Book Guide: 1938-39. Baker & Taylor Co., 55 Fifth Ave., New York City. 6 x 9 in. 156 pp.

As in previous editions, the 1938-39 guide not only lists the titles and authors of text-books covering a wide range of general and technical subjects, but carries factual descriptions of some of the more important books.

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Neville Plasticizing Oils. Neville Co., Neville Island, Pittsburgh, Penna. 6x9 in. 8 pp.

Specifications and other information on Nevinol, No. 2 Refined Heavy Oil, No. 1-D Heavy Oil and P.H.O.—plasticizing oils made by the company—are given in this booklet. Suggested uses for each type of oil are made.

Book Reviews

Kautschuk: Wandlungen in der Erzeugung und der Verwendung des Kautschuks nach dem Weltkrieg. (Rubber: Changes in the Production and Use of Rubber Since the World War). By Dr. Heinz George. Bibliographisches Institut, A.G., Leipzig, Germany. 6x9 in. 200 pp. 10 RM (approximately $4.00 at the current rate of exchange).

Number 9 in the series "Wandlungen in der Weltwirtschaft" (Changes in World Economics), this book discusses the production and use of rubber since the World War, as indicated in its title. It is divided into four sections, *viz*: consumption, production, marketing problems, and regulation of production. Numerous tables are interspersed throughout the text, while there is a statistical appendix covering net imports, areas under plantation, prices, etc. A bibliography is also included.

Editorial Comment

The Importance of Inventory Control

THE first half of the current year, insofar as rubber manufacturers are concerned, was characterized by a high degree of stability in selling prices, drastically reduced rates of production, and, as physical sales have been sustained at a higher level, very substantial reductions in inventory positions. While production of tire units was off almost 50% in comparison with the first half of 1937, shipments were off only 41%. Tire stocks at the end of last June, however, were fully 30% below those of mid-1937. The percentages are taken from a report issued by Fenner & Beane, stock brokerage house.

Although dollar sales volume was drastically curtailed in the first half of 1938, rubber manufacturers enjoyed an unusually wide differential between selling prices and crude rubber costs. Some manufacturers do not include adjustments for inventory losses in their interim statements and before such adjustments sizable earning balances were reported for periods ended in April and May. The subsequent rally in the price of crude rubber at the end of June, equal to the level which prevailed at the end of 1937, substantially obviated the inventory problem for companies which report as of that date.

Because of the high ratio of raw material costs to total costs, the trend of crude rubber prices and policies of inventory management are often more important than physical sales volumes in determining rubber manufacturing company profits.

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Death-Knell of Tire Guarantee

THE decision of the Ohio Supreme Court on July 13 in upholding the lower court on the interpretation that the road hazard tire guarantee constitutes insurance, and therefore cannot be offered by any other than a licensed insurance brokerage, sounds the death-knell for this type of guarantee in the United States. The decision was handed down in both the lower and higher court in a test case brought by the Attorney General of Ohio against the Western Auto Supply Stores.

The Attorney General made the specific charge that Western Auto Supply was "enjoying the franchise and privilege of engaging in the business of insurance" since it guaranteed its private-brand tires against defects in material or workmanship "without limit as to time, mileage or service." After dissecting all of the various guarantee forms issued by the defendant, the Ohio Supreme Court ruled, as did the lower court, that they were all substantially unconditional promises of indemnity and that "an unconditional promise of indemnity is insurance."

The unlimited road hazard tire guarantee was first introduced by Standard Oil in 1931 and spread so rapidly that practically every tire manufacturer, big and small, adopted it purely as a defensive measure. Despite the fact that it cost the industry millions of dollars annually it was maintained for more than six years. Last November, under the sponsorship of the Rubber Manufacturers Association, most of the tire producers dropped this guarantee and substituted a life-time guarantee.

There is little doubt that the tire manufacturers, with the decision of the Ohio Supreme Court as a weapon, will now carry the fight against the unlimited road hazard guarantee into every state in the country. Already, the insurance authorities of such states as Arizona, Arkansas, Georgia and Kentucky, have indicated that they too feel that the guarantee is actually an "insurance policy."

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Debt Payment with Rubber

THE suggestion made by President Vargas of Brazil to the Brazilian Council of Economy and Finances to the effect that Brazil pay off its foreign debts with rubber exports is interesting, but not particularly important. In brief, the plan provides that such debtors as the United States, Great Britain and France agree to secure at least 5% of their annual imports from Brazil, the profit secured from these transactions to be turned back to the various countries to be applied against the outstanding debt.

In the first place, in view of Brazil's insignificant share in the world production of crude rubber, it would take approximately six years before output could be materially increased. Brazil's position can be realized from the fact that in 1937 the country exported 15,576 tons of crude rubber out of total world shipments of 1,135,030 tons. At present rubber production lies almost solely in the hands of native Indians. If plantations were planned, so that the quality of Para rubber could be improved, it would take six to seven years before actual tapping could be started.

On the other hand, re-entry of Brazil into rubber production on a large scale to a point where the country would again assume an outstanding position in the world's cultivation of rubber would be welcomed by many consuming interests in this country which feel that the monopoly dominated by the British and Dutch in the Far East has exacted inordinate and unreasonably high prices for crude rubber in the past.

CURRENT • NEWS of the Rubber Industry

AUGUST, 1938

TIRE GUARANTEE DECISION UPHELD

Ohio Supreme Court Rules Unlimited Road Hazard Guarantee Represents an Unconditional Promise of Specific Indemnity

The Ohio Supreme Court, sitting at Columbus, on July 13, upheld the ruling of Ohio's State Superintendent of Insurance that the unlimited road hazard tire guarantee as used by leading mail order houses, chain stores, and other mass distributors of private-brand tires, is illegal under the state's insurance laws. The ruling specifically was against the Western Auto Supply Company in a test case brought by Attorney General H. J. Duffy of Ohio.

The ruling deprived Western Auto Supply from "enjoying the franchise and privilege of engaging in the business of insurance," since it is not licensed to conduct an insurance business in the state. Attorney General Duffy, in his complaint, charged the company with guaranteeing the tires it sold against "defects in material or workmanship without limit as to time, mileage or service . . . and for a stipulated period against any condition which shall render the tire unfit for further service."

Decision Hailed by Trade

The decision of the Ohio Supreme Court was generally hailed by manufacturers of standard brands of tires, many of whom have been waging a consistent fight against the road hazard warranty for several years. They considered the decision as a significant factor which will enable them to carry the fight into every state in the country. Insurance officials of several states have already indicated that they are of the same opinion as are the Ohio authorities.

The use of the unlimited guarantee has cost the tire industry approximately $10,000,000, according to report. It was inaugurated in 1931 by the Standard Oil Company and spread so rapidly that it was adopted by practically every tire manufacturer as a defensive measure. Last November, however, leading manufacturers substituted a standard life-time warranty, sponsored by the Rubber Manufacturers Association.

In summing up its conclusions, the Ohio Supreme Court made this statement: "We are unable to discern any essential difference in the character or effect of the various forms of agreement of indemnity made by the respondent (Western Auto Supply) and advertised in its catalogue. Each constitutes an undertaking to indemnify against failure from any cause except fire or theft and therefore covers loss or damage resulting from any and every hazard of travel, not excepting negligence of the automobile driver or another. It is substantially an unconditional promise of indemnity, and that is insurance."

The life-time guarantee of the Rubber Manufacturers Association reads as follows: "Every tire of our manufacture, bearing our name and serial number, is guaranteed by us to be free from defects in workmanship and material, without limit as to time or mileage, and to give satisfactory service under normal operating conditions. If our examination shows that any tire has failed under the terms of this guarantee, we will either repair the tire or make an adjustment on the purchase of a new tire."

Division Meeting Cancelled

The meeting of the Rubber Division, A.C.S., scheduled to be held in Milwaukee, on September 7 and 8, has been called off. Cancellation of the meeting was attributed to the fact that only three papers were submitted for presentation. The election of officers for 1939, scheduled to be held during the two-day meeting, will be conducted in September by mailed ballots. Other Divisions of the American Chemical Society will hold their meetings in Milwaukee as scheduled.

1937 Tire Value Estimated

The wholesale value of automobile tires freighted during 1937 was $492,770,000, the largest since 1930, according to the latest edition of *Automobile Facts and Figures*, issued by the Automobile Manufacturers Association. Prepared by the Rubber Manufacturers Association, the figures show that $419,689,000 of the total was for casings, $54,335,000 for inner tubes, $984,000 for solids and cushions, and $17,705,000 for tire sundries and fabrics. Included were 3,882,643 high pressure casings, 51,583,636 balloon casings, 616,748 solids and cushions, and 52,376,657 inner tubes.

RUBBER CARTEL WILL CONTINUE

Continuation of Regulation Assured for Another Five Years with Announcement by Committee Chairman that All Signatories Approve

Continuation of the current rubber restriction scheme, with minor modifications, for another five years from 1939 was confirmed on August 10, when the chairman of the International Rubber Regulation Committee announced that all contracting governments have accepted the Committee's recommendations for the extension of the agreement. Siam was the last country to approve the recommendations.

Signatory countries to the cartel are British Malaya, the Netherlands East Indies, Ceylon, India, British North Borneo, Sarawak, Siam and French Indo-China. Special arrangements are provided for the regulation of exports from Siam and French Indo-China, both of which have been granted substantial increases in permissible shipments. Approximately 98% of all rubber exports are subject to the restriction cartel.

Control System Unchanged

As in the past five years, the control system will be based on a limitation of crude rubber exports by fixing quarterly export quotas for each signatory country, the export quotas being expressed in percentages of basic quotas which are fixed in the agreement itself for each country. This system has worked fairly well in the past and is approved by countries participating in the scheme.

The major task in securing the extension of the restriction agreement was in fixing the basic quotas, since practically every signatory clamored for a larger percentage of allowable shipments. Malaya's action in relinquishing part of its basic quota served to hasten official approval from the various participants. While Malaya's share in the total export allowance for 1938 was 46.5%, it agreed to have the percentage reduced to 43.6% of the total starting with 1939.

Some of the more important changes in the restriction cartel are provisions for a moderate increase in rubber acreage and an increase in stocks which may be held within regulated areas. The basic quota for 1939 has been fixed at 1,449,000, not inclusive of Siam and Indo-China. This will increase to 1,491,000 tons in 1942.

RUBBER COMMITTEE RENDERS ITS REPORT

A number of important recommendations, including new tentative methods of testing flat rubber belting, were submitted by Committee D-11 on Rubber Products during its sessions held in Atlantic City in conjunction with the Forty-first Annual Meeting of the American Society for Testing Materials, June 27-July 1. The new tentative methods submitted amplify and replace the existing Standard Methods of Testing Rubber Belting Used for Power Transmission (D378-36). In the new standard, test procedures are given for all flat types.

A change in the Methods of Testing Rubber Hose (D 380-37 T) was approved involving method of testing thickness of a rubber element. This standard requires that a standard micrometer shall be used. It is not customary to use this instrument in the case of fire hose. Because a change in the methods of testing fire hose might necessitate revision of purchase specifications used by a wide diversity of interests, the committee is modifying the Tentative Methods D-380 providing a special procedure now in use for fire hose.

Two of the tentative specifications were recommended for adoption as standard covering friction tape and rubber insulating tape. While the requirements for friction tape may not be entirely satisfactory in some special applications, for instance, in railroad signal work where greater adhesion than the required minimum is often specified, the committee believes that the present specifications satisfactorily cover, as intended, a tape "for general use for electrical purposes" and prefers to consider issuing separate specifications for special services, as required.

Committee D-11 is working on a program of standardization in the field of valves and packings with attention devoted to performance tests intended to evaluate the materials. The committee has been investigating colorimetric methods for the determination of small amounts of manganese and copper in rubber, and expects shortly to have a report on the results of a cooperative test program.

Since many consumers and producers of rubber goods are concerned with tests for evaluating aging and cracking of rubber exposed to light, a survey of existing methods is being made and work will be undertaken to formulate standard procedures.

DeVilbiss Absorbed Howard

We have been advised that the De Vilbiss Company, Toledo, Ohio, absorbed the Howard Manufacturing Company, its wholly-owned rubber manufacturing subsidiary, last fall. All rubber manufacturing operations of DeVilbiss are now conducted by the Rubber Products Division of the DeVilbiss Company. The company specializes in the manufacture of rubber spray equipment and hose.

Coming Events

Aug. 19. Outing, Boston Rubber Group; Weston Country Club, Weston, Mass.

Sept. 5-9. Fall Meeting, American Chemical Society, Milwaukee.

Sept. 7-8. Fall Meeting, Rubber Division, A.C.S. (cancelled).

Sept. 16. New York Group, Rubber Division, A.C.S., Building Trades Club, New York City.

Oct. 4. Los Angeles Group, Rubber Division, A.C.S., Mayfair Hotel, Los Angeles.

Oct. 5-7. American Society of Mechanical Engineers, Providence, R. I. (including a Symposium on Rubber).

Oct. 10-12. Annual Meeting, N.A.I.T.D., Hotel Jung, New Orleans, La.

Oct. 10-14. National Safety Congress, Hotel Stevens, Chicago, Ill.

Oct. 17-19. Fall Convention, National Ass'n. of Waste Material Dealers, San Francisco.

Nov. 4. Boston Group, Rubber Division, A.C.S., Boston.

BOSTON GROUP OUTING SET FOR AUGUST 19

The 1938 Outing of the Boston Group, Rubber Division, A.C.S., will be held on August 19, at the Weston Country Club, Weston, Mass. The club is one of the most scenic eighteen-hole golf courses in New England and is located eight miles west of Boston, near the Boston Post Road.

In addition to the usual golf tournament, arrangements have been made for soft ball games, tennis, bowling, horseshoe pitching, etc. Prizes will be awarded to the winners in the various events, with special prizes for the tallest, shortest, fattest, thinnest, etc.

Dinner is scheduled for 7:00 P. M. After dinner a "surprise entertainment program" will be presented, details of which are being withheld by the Entertainment Committee. Tickets for the outing are $2.00 each, and may be secured from Dr. Alan R. Lukens, secretary-treasurer, 11 Windsor Street, Cambridge, Mass.

U. S. Absorbs Chatham

United States Rubber Products, Inc., has acquired the Chatham Manufacturing Company, maker of rubber thread at Portland, Conn. Chatham was organized in 1920 and was jointly owned by the American Mills Company, the Russell Manufacturing Co., and the Ansonia O. & C. Company. According to present plans, the factory will be operated as the Portland Plant of U. S. Rubber Products, Inc.

Who makes air bag molds? A Classified List of Rubber Machinery and Equipment is included in the 1937 RUBBER RED BOOK. Paper-bound copies, $2.00; cloth-bound, $3.00.

CONSIDER RUBBER FOR DEBT PAYMENTS

The Federal Technical Council of Economy and Finance of Brazil has under consideration a plan submitted to it by President Getulio Vargas on August 9 for payment of Brazil's foreign debts with Brazilian-grown rubber. The plan embodies a proposal that the country's foreign debtors, mainly the United States, Great Britain and France, consent to allow 5% of their rubber purchases to come from Brazil.

According to the plan, the Instituto de Borracha (Crude Rubber Institute) would carry out all the necessary transactions with foreign countries. The Institute would pay Brazilian exporters in milreis, the national currency, for rubber shipments, received in turn from the buyers' foreign currency, which would be sufficient for the payment of interest and amortization of the external debt.

No decision has been made by the Brazilian Council on the plausibility of this plan at this writing, but one is expected shortly. The plan was drafted by Francisco Ebling, a Brazilian financial expert, and a frequent visitor to this country.

LATEX TANKS ERECTED AT BOSTON ARMY BASE

Six 20,000-gallon tanks for the storage of latex have been erected at the Army Base in South Boston, Mass. The tanks were erected for the Dunlop Tire & Rubber Co., Buffalo, N. Y., and American Anode, Inc., Akron, Ohio. Distribution will be handled from Boston by Charles T. Wilson & Co., Inc., of New York City, domestic agents for Dunlop Latex, Ltd., while the Piers Operating Co., operators of the Army Base Terminal, will be in charge of receiving and shipping.

The storage tanks are 10 feet in diameter and 35 feet in height, and are equipped with agitators to keep the latex from congealing. Latex will be pumped directly from tank holds in incoming vessels to the storage tanks. Provision has been made for the location of additional tanks at a later date. The installation is said to be the first of its kind in this country and the third in the world.

Fire at Vultex Plant

Fire of undetermined origin caused substantial damage to the plant of the Vultex Chemical Company at Cambridge, Mass., on July 15. The development and research laboratory and a large amount of ordinary latex and prevulcanized latex were almost totally destroyed. The manufacturing department, control laboratory and chemical storage divisions suffered only slightly, according to Vultex officials. Fairly extensive service to the company's customers was resumed two or three days after the fire. It is estimated that approximately $75,000 will be spent in replacing damaged buildings and materials.

N. Y. GROUP MEETS ON SEPTEMBER 16TH

A meeting of the New York Group, Rubber Division, A.C.S., will be held on Friday, September 16, at the Building Trades Club, 2 Park Avenue, in New York City. One of the papers originally scheduled for presentation at the Milwaukee meeting of the Rubber Division, which has been called off because only three papers were prepared for discussion, and a talk by a member of the Federal Bureau of Investigation, will feature the meeting.

The technical paper is titled "Effect of Temperature on the Mechanism of Oxidation of Rubber." It was prepared by A. R. Kemp and J. H. Ingmanson, of the Bell Telephone Laboratories, and will be delivered by Mr. Ingmanson. The paper is the second in a series which the co-authors are working on and covers the results of studies on the rate of oxidation of vulcanized rubber compounds, with and without antioxidants, at various temperatures. A number of slides will be shown.

Inspector E. P. Coffey is expected to appear for the F.B.I. Inspector Coffey is widely known for his expert work in the field of criminology and recently concluded a study of technical crime laboratories in foreign countries. Whether Inspector Coffey puts in appearance, or some other representative of the "G-Man" Department, the discourse is expected to hold unusual interest.

Tickets for the meeting are $2.00 each, and may be secured from Peter P. Pinto, secretary-treasurer of the Group, c/o THE RUBBER AGE, 250 West 57th Street, New York City. Early reservations are urged.

A.S.M.E. ORGANIZES RUBBER COMMITTEE

That applications of rubber and plastics are rapidly forging ahead is clearly evident from the attention now being devoted to these materials. Indicative of the trend, the American Society of Mechanical Engineers recently established a committee, or subdivision, on rubber and plastics which will deal with several phases of the rubber and plastics industries including mechanical applications, research on basic mechanical properties, processing equipment, and standards. Activities of the group will be beyond the normal range of other professional organizations in an effort to fill the present gap in the mechanical field.

The committee will sponsor the presentation of papers at technical sessions of the regular quarterly meetings of the A. S. M. E. A symposium on rubber, comprising four invited papers covering the history of rubber, synthetic substances with rubber-like properties, fabrication of rubber parts, and certain mechanical properties of rubber, is included in the program of the next meeting of the Society to be held at Providence, October 5-7. Participation in activities of the committee will not be restricted to members of the parent society.

Authors of papers believed suitable for presentation at subsequent quarterly meetings should communicate at least four months in advance with Dr. J. F. Smith, Edward G. Budd Mfg. Company, 25th Street and Hunting Park Avenue, Philadelphia, Pennsylvania, secretary of the rubber and plastics committee; or with the chairman, Dr. F. L. Yerzley, E. I. du Pont de Nemours & Co., Inc., P. O. Box 525, Wilmington, Delaware.

Forms Sales Agency

J. Timothy O'Hara, formerly associated with the Amthor Testing Instrument Company, has organized his own sales agency to deal in testing instruments for the rubber, wire and allied industries. Offices are maintained at 620 East 43rd Street, Brooklyn, N. Y.

Birkenstein & Co. Organized

Albert Birkenstein, associated with S. Birkenstein & Sons, Inc., Chicago, Ill., for the past several years, has withdrawn from that company and has organized Al. Birkenstein & Co., with offices at 205 West Wacker Drive, Chicago. He will specialize in scrap rubber.

8TH ROAD CONGRESS HELD IN HOLLAND

The Eighth International Road Congress, organized by the Permanent International Association of Road Congresses, was held at Scheveningen, The Hague, Holland, from June 18 to July 2. Delegates from 38 countries were in attendance and a large number of technical papers were presented.

Three of the papers presented were of special interest to the rubber industry: *Rubber Surfaces,* by W. Jaggar, Borough Engineer and Surveyor of Huddersfield, England; *Rubber for Roadway Purposes,* by Dr. Ir. Th. G. E. Hoedt, director of the West Java Proefstation, Buitenzorg, Java, N.E.I.; and *The Application of Rubber in Road Construction,* by J. G. Fol, technical engineer of the International Association for Rubber Cultivation, The Hague.

An exhibition was conducted in conjunction with the Congress at which rubber road blocks, traffic lines, studs, and various samples of rubber-bitumen and rubber-asphalt products for road use were displayed. The Rubber Stichting, of Amsterdam, showed the applications of rubber in various forms of road construction, with graphs illustrating the research work carried out, and photographs of demonstration areas.

GIANT CONVEYOR BELT AT GRAND COULEE DAM

The largest conveyor belt ever manufactured has been placed in operation at the Grand Coulee Dam in the State of Washington. The belt, produced by the Goodyear Tire & Rubber Co., Akron, operates on centers of 4,850 feet, and measures 9,700 feet long, approximately twice the length of the longest previous conveyor belt ever employed, according to Goodyear. Of 48-inch width and 8-ply construction, the belt was manufactured in eight separate pieces weighing 10 tons each to facilitate handling and transportation, and was shipped in rolls approximately 10 feet each in diameter. Thirty tons of cotton and fifty tons of rubber went into its construction. Moving at a speed of 450 feet per minute, the belt will carry coarse stone, six-inch and minus, for an 11-minute ride, providing a flow of 2,000 tons per hour of aggregate. Supplementing the main conveyor are some additional 20,000 feet of vari-sized belting used to gather, classify, store, recover and transport the aggregate through the screening and washing plant located at the source. In summer, approximately 90 h.p. is required to put the empty belt in motion; in winter, about 125 h.p.

FINANCIAL NEWS

DEFICIT OF $239,213 SHOWN BY U. S. RUBBER

A capital surplus of $11,159,633 on June 30, 1938, as compared with a deficit of $10,471,627, on December 31, 1937, is shown in the report of United States Rubber Company for the six months ended June 30, 1938. For the first time, the company has included its 39 subsidiaries in a consolidated report. Continuing its policy of reducing indebtedness, by drawing on its cash resources, the company showed a reduction of $5,000,000 in its funded debt, during the six months' period.

Net income before inventory adjustments for the six months' period was $1,996,193 in the full consolidation. After adjustment of inventories to market values, and other provisions as of June 30, of $2,235,406, a net deficit of $239,213 is shown for the period. Since June 30, 1938, rising commodity prices have offset the inventory adjustment.

Net income before adjustments on the basis comparable with previous reports was $813,796, for the six months of 1938, compared with $6,762,964 for 1937. On the same basis, 1938 sales were 35% less than in 1937. On the basis of full consolidation net sales were $67,829,786 for the first six months of this year. As consolidated heretofore, net sales for six months of 1938 were $61,457,244, a decrease of $33,318,694 from the $94,775,938 sales of the first six months of 1937.

39 Subsidiaries in Consolidation

The full consolidation includes United States Rubber Company and thirty-nine subsidiaries, of which seven are in Canada, four in the Far East and twelve in other foreign countries. Included for the first time are six domestic subsidiaries, six English subsidiaries and four plantation subsidiaries—a total of sixteen.

The United States Rubber Company is the largest owner of rubber-growing plantations in the world. The company's plantations activities are now for the first time included in the full consolidated reports. Expressed separately as heretofore, those activities had a profit of $198,718 after depreciation and amortization of $937,547 and all other charges. These plantation properties, at net value, are carried in the company's consolidated balance sheet at $23,518,515.

The company's net current assets, full consolidation, were $62,375,786 on June 30, 1938. This compares with $57,939,342 for the same date as consolidated heretofore, and $63,541,453 on December 31, 1937. Ratio of current assets to current liabilities, full consolidation, was 3.56 to 1 on June 30 last; as compared with 3.62 to 1 on the old basis, and compares with 3.37 to 1 as of December 31, 1937.

The net value of properties, plants and equipment, was $79,733,840, full consolidation; compared with $50,888,605 for the same six months ending June 30, 1938, as consolidated heretofore. This increase in properties assets is due largely to the inclusion in the new consolidation of the $23,518,515 investment in plantations.

In his discussion of the report, F. B. Davis, Jr., president of U. S. Rubber, said that the authorized common stock, consisting of 1,918,412 shares after the retirement of the 81,588 shares previously held in the name of a subsidiary, was changed from shares without par value to shares of $10 par value. The outstanding 1,567,261 shares of no par value, which previously had a stated value of $100,895,401, now have an aggregate par value of $15,672,610, the difference of $85,222,791 being used to create a capital surplus account.

From this capital surplus account there was deducted the deficit on December 31, 1937; the net loss for the period ending June 30, 1938; the premiums on the redemption of the 5% bonds; and various other adjustments fully detailed in the report; leaving the June 30, 1938 capital surplus totaling $11,159,633.

Monsanto Chemical Co.

Second Quarter: Net income of $555,424, equal to 37½ cents a share on 1,241,816 shares outstanding after deduction for preferred dividend requirements and minority interests. This compares with net income of $1,441,405, or $1.29 a share on 1,114,408 shares, reported in the June quarter of 1937. Earnings applicable to common stock for the first half of this year amount to $1,224,734, equal to 89 cents per share after dividend requirements and minority interests.

General Cable Corp.

Second Quarter: Net loss of $260,083, after interest, depreciation, taxes, etc., but before inventory adjustments, which compares with net income of $1,068,924, equal to 79 cents per common share, in the corresponding period of the previous year. For the first six months of this year net loss amounted to $326,230, compared with net profit of $1,956,576, or $1.26 a common share, reported for the first half of 1937.

Baldwin Rubber Co.

Second Quarter: Net loss of $17,542 which compares with net profit of $159,616, or 57 cents a common share, in the 1937 quarter, and net loss of $31,675 in the first quarter of the current year. For the nine months ended on June 30, net profit amounted to $24,740, or 7 cents a common share.

FIRESTONE TO OFFER NEW FINANCING PLAN

Firestone Tire & Rubber Corp., Akron, will launch a loan offering of $50,000,000 in the fall, according to report in New York's financial circles. Negotiations between the company and investment bankers are said to be in progress, although many details of the offering have not yet been determined.

It is understood that the greater part of the loan will represent "new money" financing. The major part of the proceeds would be applied to the payment of Firestone's bank loans which total approximately $27,500,000. While the parent company has no outstanding funded debt, it is believed that part of the proceeds would also be used to wipe out the funded debt of subsidiaries amounting to $13,300,000.

Outstanding debt of subsidiaries consists of $5,500,000 of 15-year 5s, due September 1, 1942, of the Firestone Tire & Rubber Co. of California, and $7,800,000 of 20-year 5s, due March 1, 1948, of the Firestone Cotton Mills. The issue is not expected to be ready for registration with the Securities and Exchange Commission for several weeks.

Thermoid Company

First Half: Net loss of $79,632, which compares with net profit of $260,281, or 40 cents a share on 469,823 common shares, in the corresponding period of 1937. Net profit of $16,109, equal to 40 cents a share on 39,956 shares of $10 preferred stock, was reported for the quarter ended June 30, which compares with net loss of $95,741 in the preceding quarter, and a net profit of $109,887, or 16 cents per common share, in the June quarter last year.

Fisk Rubber Corp.

First Half: Net profit of $172,298, equal to 15 cents each on 439,535 shares of common stock after dividend requirements on the $6 preferred stock, which compares with $435,962, or 75 cents a common share, for the first six months of last year. Net sales in the first half of this year totaled $6,919,928.

Pharis Tire & Rubber

First Half: Net profit of $224,116, equal to $1.02 each on 220,000 common shares, which compares with net profit of $23,673, or 10 cents a share, in the corresponding period of 1937. Gross sales for the first six months of this year amounted to $3,882,060, as compared with $3,451,774 last year.

Dayton Rubber Mfg. Co.

Eight months ending June 25: Net profit of $251,966, before provision for excess profits taxes and surtax, but after all other charges, equal to $1.07 each on 176,839 common shares after preferred dividend requirements.

ADVERTISING PAGES REMOVED

Names in the News

G. E. BRUNNER, formerly assistant manager of original equipment tire sales for the B. F. Goodrich Co., Akron, has been named general sales manager of that division, succeeding THOMAS A. ASPELL. GEORGE M. MADOLE, formerly assistant managing director of Goodrich at Colombes, France, has been named assistant general sales manager of the division.

DR. ALAN R. LUKENS, research director, Cambridge (Mass.) Laboratories, Thompson, Weinman & Co., Inc., and secretary of the Boston Rubber Group, has won the Alvan T. Fuller Sailing Trophy. Graduates and the staff of M.I.T. compete with the regular students for this trophy, awarded to DR. LUKENS for a sailing percentage of 85% during twenty-six dinghy races during the early summer.

D. F. WOOD, traffic manager of the Binney & Smith Company for the past twenty-one years, has retired. After a lengthy vacation, he will remain with the company as traffic consultant, visiting the office one day a week. C. D. MACKNEE has been named traffic manager while J. D. SPRUILL will act as his assistant.

THAYER B. FARRINGTON, one-time general manager in charge of engineering for the B. F. Goodrich Company at Akron, and later vice-president and general manager of Pacific Goodrich, has opened an office in the Central National Bank Building, Cleveland, Ohio, for his newly-established business of consulting engineer for manufacturing and other corporations.

A. L. FREEDLANDER, president and general manager, Dayton Rubber Manufacturing Corp., Dayton, Ohio, has been named a member of the executive committee of the manufacturers' council of the Dayton Chamber of Commerce.

L. A. LAURSEN, well-known inventor of rubber machinery, underwent an operation at City Hospital in Akron last month for the removal of gallstones. At last reports, his condition was satisfactory.

CHARLES W. UFFORD, personnel manager, Ohio Rubber Company, Willoughby, Ohio, addressed the members of the Exchange Club in Akron on July 27. He discussed labor problems.

FRED C. BATCHELLOR, formerly associated in a sales capacity with the General Atlas Carbon Company, and widely known in the rubber industry, is now representing Hotel Ritz Tower. He may be reached at Hotel Ritz Tower, Park Avenue at 57th Street, New York City.

EDWARD HUTCHENS, president, Utility Manufacturing Co., Cudahy, Wisconsin, is sailing on the Queen Mary on September 7 for an eight months' trip around the world. Combining pleasure with business, he will visit rubber factories throughout the world and also spend some time investigating rubber plantations. He will return to this country about May 1, 1939.

WILLIAM S. CARLETON, manager of the Eastern Division since 1928, and Lester D. Bigelow, manager of the Western Division since 1933, have both been elected vice-presidents of the Hewitt Rubber Corporation, Buffalo, N. Y. The former has been with Hewitt for eighteen years, while the latter has had six years of service. Joseph H. Hayden, secretary of the company, has also been elected a member of the board of directors.

DAVID C. SCOTT, JR., of the Henry L. Scott Company, Providence, R. I., has become engaged to Miss Helen Safford Bonnell, of Chestnut Hill, Philadelphia. The announcement was made from London, England, last month, where the wedding will take place shortly. After a wedding trip, they will reside in Providence.

R. W. HUTCHENS, president and general manager, Gillette Rubber Co., Eau Claire, Wisconsin, has been elected to an office in the State Grand Commandary of the Knights Templars of Wisconsin. A reception was tendered him on August 5.

L. F. WILSON has been named manager of the newly-created resale merchandising division of the B. F. Goodrich Company's purchasing department, in which capacity he will buy all merchandise intended for resale by the company. He has been associated with Goodrich and affiliated companies in sales capacities since 1927.

Germany's Gas Black Imports

Despite consistent efforts to produce black pigments in Germany which could be utilized as a substitute for American carbon blacks, particularly for use in the domestic rubber industry, and despite the claims for the quality of these substitute blacks, imports of American carbon black into Germany increased appreciably in 1937. In 1935 imports jumped from the 7,504 metric tons of the previous year to 11,162 tons, but declined to 7,078 in 1936. In 1937, however, imports rose to 11,683 metric tons, a new all-time record. For the first two months of the present year, imports amounted to 1,616 tons.

Rhodes Heads Association

Dr. Edgar Rhodes, internationally-known rubber and latex technologist, has been appointed Senior Rubber Technologist, which amounts to the directorship, of the recently-formed British Rubber Producers' Research Association in London. Dr. Rhodes was born in Yorkshire, England, in 1900, and received an M. Sc. in Chemistry from Leeds University in 1922. In 1924 he received a Ph. D. in Botany after spending two years in biochemical research at the University. For the past six years he has been head of the Chemical Division of the Rubber Research Institute of Malaya, is also currently demonstrator in plant physiology at Leeds University and a biochemist for the British Cotton Industry Research Association of Manchester. He is responsible for the designing and equipping of the chemical and rubber testing laboratories recently opened in the new Institute building. Dr. Rhodes is the author of numerous technical papers.

New Goodrich Laboratory

B. F. Goodrich Company will start construction work shortly on a new laboratory to be erected adjacent to the chemical building in Plant No. 3 in Akron. Contracts for the structure, which will cost approximately $18,000, have already been let. It will be three stories high, of glass and steel, with all-grating floors. According to the building permit, the new laboratory will be of open-type construction, without partitions, and will measure 40 by 50 feet.

Cabot Obtains Patent

U. S. Patent No. 2,120,541, covering a specific method for the manufacture of carbon black, dated June 14, 1938, based on the application made by Billings and Offutt, has been issued to Godrey L. Cabot, Inc. The patent discloses a special apparatus for producing carbon black in spherical granules.

NEW ENGLAND NEWS

The Naugatuck, Conn., footwear plants of the United States Rubber Products, Inc., have been informed by the National Safety Council of a citation for safety achievement during the past year. The council's publication termed the Naugatuck establishment "the safest large rubber plant in the entire rubber industry", and said that it had "fewer lost time accidents and a lower accident severity rate than any other rubber factory of its size."

A. G. Spalding & Bros. is moving its accounting division from the main office in New York to the Chicopee, Mass., plant, with indications that eventually the entire main office will be transferred to Chicopee. The inflated rubber goods department, which produces foot, basket, soccer and volley balls, has been returned to the Brooklyn, N. Y., plant, with about 65 workers following the division back to Brooklyn. The company is reported as considering the consolidation of all production at the Willimansett plant.

Fisk Rubber Corp., Chicopee Falls, Mass., rehired more than 300 employees during July, with more reemployment in prospect, following a notable improvement in business.

Stephen Downing Klyce of the engineering department of Hood Rubber Co., and Miss Hildegarde Meister of Dresden, Germany, will be married this fall. Their engagement was announced recently at Portsmouth, N. H.

Norwalk Tire & Rubber Co., Norwalk, Conn., has declared a dividend of $1.75 a share on its preferred stock, payable August 18 on stock of record on August 8. The previous payment was $3.87½ a share in September of last year.

Whitney-Blake Co., Hamden, Conn., maker of insulated wire, reports a steady increase in orders during recent weeks. The backlog is now well over $350,000, according to L. P. Sawyer, vice-president. The plant has been operating on a five-day basis, with some departments on a longer schedule. Expansion of plant space is being considered and a financing plan is now before the Securities and Exchange Commission in Washington.

Employees of United States Rubber Products, Inc., Naugatuck, Conn., returned to work July 18 after the annual shutdown of two weeks. More than 4,000 received two per cent of their year's pay as a vacation bonus. Walter H. Norton, factory manager, announced that the fabric shoe mill will operate on a three-day schedule and the waterproof department on five days. The plant, he said, is ready to shift from one product to another to avoid adding to the excessive waterproof inventories "built up during the first six months of the year when we were striving to provide work for our employees." Some units in the fabric shoe mill are working four and five days a week on special customers' orders.

Making Latex Adhesives

Robert G. Moore, 1341 South Hope St., Los Angeles, California, is manufacturing a line of latex adhesives under the name of "Duntex." One of these, "Duntex-101," is described as "a fluid latex cement for use where a high degree of elasticity and flexibility is required in the bond," and is said to be suitable for leather, cloth, paper, pasteboard, etc. Another, "Duntex-105", is recommended for cementing asphalt tile, rubber tile, wall board, plastic sheeting, etc. Mr. Moore also acts as Pacific Coast representative for Charles T. Wilson, Inc., of New York City.

Gadsden Takes Tire Lead

The Gadsden, Alabama, plant of the Goodyear Tire & Rubber Company is now the biggest producer of Goodyear tires, according to a statement made by Clifton Slusser, vice-president and factory manager of the company during a recent visit to the plant. "The Gadsden plant is making more tires than our plant at Akron," Mr. Slusser said. "It is turning out 8,000 tires and 8,000 tubes daily, while 7,000 tires are being made at the Jackson, Michigan, plant and 4,700 at the Los Angeles plant."

Convention Date Approved

The National Association of Waste Material Dealers, Inc., Times Building, New York City, advises that Joseph Schapiro, president, has definitely approved the holding of the Association's fall convention in San Francisco on October 17-19. This is the first time that a national convention representing the waste material trade has been held west of Chicago.

Organize Planters Group

P. M. Morel, 87 Rue MacMahon, Saigon, French Indo-China, has advised the French Embassy in the United States that he has organized a group of rubber planters and is desirous of making connections with American companies which would be interested in dealing direct with this group. Interested parties should communicate direct with Mr. Morel.

Auction Waldo Properties

All of the properties of E. M. & F. Waldo, Inc., Muirkirk, Maryland, including land, buildings, equipment, raw materials, finished stock, etc., were scheduled to be sold at public auction on August 15, by virtue of an order of the District Court of the United States, for the District of Maryland. The assets were to be first offered in entirety and then offered in parcels if the highest bid made was not acceptable to the trustee. Waldo entered financial difficulties several months ago. James P. Curley, Laurel, Maryland, is referee in bankruptcy.

Consent Order Issued

The National Labor Relations Board on July 19 issued an order against the Schacht Rubber Manufacturing Co., Huntington, Ind., based upon a stipulation agreement of March 31, previously approved by the Board. The agreement settled unfair labor practice charges filed against Schacht by Local No. 130 of the U.R.W.A. Under the terms of the order, the company is required to cease discouraging membership in the union and committing other unfair labor practices.

DuPont Rubber Lubricant

An entirely new lubricant, under the trade-name of "Orel," which does not affect rubber in any way and which is said to possess penetrating qualities which enable it to go where ordinary lubricants cannot reach, has been introduced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. "Orel" is described as a "perfect anti-squeak for all rubber-to-metal chassis parts," such as bushings, spring shackles, sway eliminator bars, motor and body mountings, rubber insulations between spring leaves, etc.

United Carbon Co.

First Half: Net income of $813,049, equal to $2.04 per common share, which compares with net profit of $1,365,368, or $3.43 per share, in the corresponding period of 1937. A net profit of $374,685, or 94 cents a share, is reported for the second quarter of the current year, which compares with $643,000, or $1.62, in the quarter ended June, 1937, and $438,364, or $1.10, in the previous quarter.

N. J. Zinc Co.

First Half: Net profit of $1,386,858, equal to 70 cents each on 1,963,264 shares of $25-par capital stock, which compares with $4,351,782, or $2.21 a share, last year. For the quarter ended June 30, net profit was $734,262, equal to 37 cents a share, which compares with $652,596, or 33 cents a share, in the preceding quarter, and $2,181,941, or $1.11 a share, in the second quarter of 1937.

LOS ANGELES NEWS

The tenth anniversary of the Firestone Tire and Rubber Company's plant in Los Angeles was observed with considerable ceremony in July. R. J. Cope, president of the plant, in an address to newspapermen and others, went into detail on the advancement made in tire manufacture as well as in the quality of tires since the plant was opened in 1928. The first tire produced on the morning of the tenth anniversary was turned over by Clyde Smith, superintendent, to H. D. Tompkins, sales manager, and R. J. Cope, president, the latter two officially complimenting Mr. Smith on the accomplishment and in the presence of visitors showing some of the differences between this tire and the first one produced in the factory, the latter tire being preserved here for such comparisons.

Forty-one men, one more than quota, went on the annual deep-sea fishing excursion of the Los Angeles Rubber Group on Saturday, July 23. The group went from Los Angeles to San Diego by automobile on Friday evening, meeting at the San Diego Hotel that evening for the annual supper which has become a feature of the excursion. The trip to Coronado Islands off the coast of Mexico was made on the *Star Angler*, a deluxe ship also used last year. The vessel took off at 4 A. M. and got back in time to permit return to Los Angeles that evening for those who desired to do so.

Moving pictures were taken and these will be shown at the first annual supper meeting of the group in October. At the Friday evening dinner in the San Diego Hotel moving pictures of the last two excursions were shown.

Twenty-two prizes in all were awarded. First prize went to Harry L. Kincade (U. S. Tire Dealers' Mutual Corporation) and second prize to R. M. LeRoy (Goodrich). Other top winners were Francis J. Keefe (Southwestern Rubber), R. H. Bonham (Goodrich), and John J. Burns of the MacClatchie Manufacturing Company. First prize was a rod and reel offered by the rubber group as an organization, and second prize was a reel offered by the Dill Manufacturing Company. Among other firms donating prizes were the following: H. Muehlstein and Company, J. M. Huber Company, H. M. Royal, Inc., American Cyanide and Chemical Corporation, San Francisco Sulphur Company, Blue Star Mines, Ltd., A. Schrader's Son, Johnson Steel and Wire Company, and Western Shade Cloth Company.

Taking an active part in promoting the excursion were Ed Royal and Garvin Drew. A major problem arose this year in transporting the immense number of fish caught from San Diego to Los Angeles, while the size of many fish also made automobiles of average size rather inadequate carriers. However, the excursion on the whole has been pronounced the most successful to date and is considered thoroughly established as an annual summer event.

Plans are complete for resuming the monthly supper meetings of the Los Angeles Group, Rubber Division, A.C.S., according to Ed Royal, chairman. Tuesday evening, October 4, will be the date for the first meeting in the Rainbow Room of the Mayfair Hotel. The plan in effect for several years will be continued insofar as prizes are concerned. Major rubber companies will successively conduct programs, for a time at least, the first program, according to present plans, to be put on by one of the "Big Four." Growth in membership has been rapid and is now several times what it was three years ago.

Charles Lamb, vice-president of the West American Rubber Company, has returned from a trip through the East where he visited various manufacturing plants and purchased some new equipment.

The Dayton Rubber Manufacturing Company is now occupying new quarters at 2439 South Broadway, Los Angeles, and has consolidated under one roof the offices formerly at 420 South San Pedro Street and the warehouse formerly at 1330 South Grand Avenue. W. C. Webb is in charge.

The Kirkhill Rubber Company reports gross volume of business to date equal to that of last year with profits better than last year despite the so-called recession. The company has recently installed a new stand-by 125 horsepower boiler.

The U. S. Rubber Company, Samson Division, has been running full time since July 15, twenty-four hours per day, with more than 150 laid-off men now back at work.

T. Kirk Hill, president of the Kirkhill Rubber Company, has returned from a two months' cruise to Jamaica Island and various points along the north coast of South America. He visited the three Guianas spending some time at Georgetown and Paramaribo. He had the experience of pushing upstream 117 miles into the wilds of Dutch Guiana taking moving pictures in color as he went. He visited the old rubber plantations on Trinidad Island and touched at such ports as Mobile, Tampa, Kingston and others. He touched at different islands in the West Indies and disembarked at New Orleans.

Lower Right: A group on the deck of the "Star Angler" prior to shoving off. Upper Left: Close-up of five Los Angeles fishermen with their prize catches.

Obituaries

Homer Eugene Sawyer

Homer Eugene Sawyer, prominently associated with the activities of the United States Rubber Company until his retirement on a pension in 1931, died suddenly at the age of 72 in Asheville, N. C., on July 27. Death was attributed to a heart attack. Mr. Sawyer was born in Holliston, Mass. Soon after being graduated from the famous English High School in Boston, he went to work for the Boston Rubber Shoe Company in Malden, Mass., in 1885, and was rapidly advanced to factory manager. He then entered the footwear sales division of the company, and when it was absorbed by the United States Rubber Company he became sales manager for the consolidated footwear divisions of the new organization. In 1913 Mr. Sawyer became general manager of the footwear division and in 1919 was named vice-president in charge of manufacturing and selling of footwear and clothing. In 1927 he was elected an executive vice-president and held this position until placed on a consulting arrangement in 1929. He retired from all business activities and was placed on the company's pension roll two years later. From 1906 to 1929 he was a member of the U. S. Rubber directorate. During the World War, Mr. Sawyer served as a member of the War Industries Board. He was a member of several clubs in Palm Beach and New York, including the Racquet and Tennis Club. In recent years he had made his home in Palm Beach, spending several months each summer in Asheville. Interment was in the family plot at Holliston, Mass. He leaves a son and two grandchildren.

Walter L. Davol

Walter L. Davol, vice-president, secretary, and assistant treasurer of the Davol Rubber Company, Providence, R. I., died suddenly on August 2 at the home of a friend in Rumford, Conn. He was stricken with a heart attack while driving past his friend's home. He was 45 years of age. Born in Providence, Mr. Davol received his education at Worcester Academy and Brown University, and entered the automobile distribution industry after leaving the University. During the World War he served in the Navy and was honorably discharged as a machinist's mate. He entered the sales department of the Davol Rubber Company soon after leaving the Navy. In 1933 Mr. Davol was named assistant managing executive of Davol and in 1936 assumed the added duties of assistant treasurer. Last year he became vice-president and secretary, and became largely responsible for factory production. Mr. Davol was a 32nd degree Mason, a past commander of the Stark-Parker Post of the American Legion, and a member of the Metacomet Golf Club. He was also a trustee of Worcester Academy. Funeral services were held on August 5. He leaves a widow.

Thomas A. Aspell

Thomas A. Aspell, general sales manager of the original equipment tire division of B. F. Goodrich Company for the past nine years, and who recently was assigned to executive sales duties, died on August 1 in Akron after a year of ill health. He was 54 years of age. His death occurred on the thirty-first anniversary of his joining Goodrich as a carriage tire salesman in New York. Born in New York, Mr. Aspell attended the Packard School of Business Administration, and joined the first Goodrich tire distributor in New York shortly after being graduated. Later, he was placed in charge of Goodrich's commercial tire sales in the New York territory. In 1916, he went to the Mexican border as Goodrich representative and technical adviser on tires to the Army Transport Corps. He occupied a similar position in Washington during the World War. After the war, Mr. Aspell served as sales manager of the truck and bus tire division in Akron, and in 1928 was named assistant manager of manufacturers' sales. One year later he became manager of the original equipment tire division. In recent years he had also been in charge of aeronautical product sales. He leaves a widow, three daughters and two sons.

Dr. G. M. J. Mackay

Dr. George M. Johnstone Mackay, director of research for the American Cyanamid & Chemical Corp., at the Stamford, Conn., laboratories, died at his summer home in Speculator, N. Y., of complications following an attack of pneumonia, on July 29, on his fifty-fifth birthday. Born in Pictou, Nova Scotia, Dr. Mackay was graduated from Dalhousie University in 1905, and later attended the Massachusetts Institute of Technology. After serving for many years with the General Electric Company, where he was associated with Dr. Irving Langmuir in the development of the incandescent lamp, he joined American Cyanamid in 1933. During the World War, Dr. Mackay was active in work on submarine detection methods. He was a member of the National Research Council, the American Chemical Society, the American Physical Society, and other technical organizations. He leaves a widow and two sons.

R. H. Swartwout

Richard Henry Swartwout, retired broker and former chairman of the board of the Fisk Rubber Company, died on July 21 in Southampton Hospital, Southampton, L. I., N. Y., following an appendectomy. He was 63 years of age. Born in Morristown, N. J., Mr. Swartwout was educated in public schools and attended Stevens College. He entered the stock brokerage business in New York City in 1893, and rose steadily in financial circles. Before his retirement from active business life in 1927, he was associated with many large corporations. When the Fisk Rubber Company was reorganized in 1932, Mr. Swartwout, who had much experience in reorganization and management, was persuaded to become chairman of the board of the new company, a position he held until his resignation a few years later. Funeral services were held on July 24. He leaves a widow and daughter.

Morris Michtom

Morris Michtom, president of the Ideal Novelty & Toy Co., and also president of the Admiar Rubber Co., an affiliated firm, died on July 21 at his home, 180 Winthrop St., Brooklyn, N. Y., after a long illness. He was 68 years of age. Born in Russia, Mr. Michtom came to the United States in 1889, and founded the Ideal company in 1903. A former director and treasurer of the Toy Manufacturers Association, he was one of the first manufacturers of stuffed animals and was instrumental in making the "teddy bear" type of doll popular in this country. Mr. Michtom was active in philanthropic work and was a member of several organizations dispensing charity. He leaves two sons and a daughter.

Lewis O. Brewster

Lewis Oakley Brewster, for many years vice-president and general manager of the New York Insulated Wire Company, later absorbed by the Essex Wire Corporation, died at the home of his son in Elizabeth, N. J., on July 31. He had been removed to his son's home after spending six weeks in a hospital. Mr. Brewster retired from active business about six years ago, after serving for more than 35 years with New York Insulated Wire. For many years he was secretary of the Bay Head (N. J.) Yacht Club, and at one time served on the Bay Head Town Council. Funeral services were held in Elizabeth on August 2. He leaves a widow and four sons.

Superlatex Assigns

Superlatex Products, Inc., 17-19 Rose Street, New York City, manufacturers of latex products, made an assignment on August 16 to Philip Rabinowitz, 1540 East 9th Street, Brooklyn, N. Y. The company has been specializing in the production of religious figures cast from latex.

New Rubber Goods

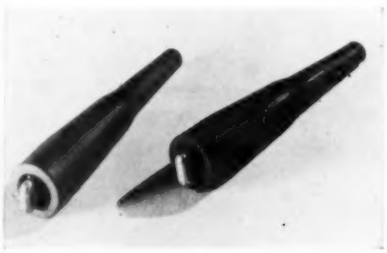
Perfection Air Cells

Non-metallic arch cushions, under the name of Perfection Air Cells, have been placed on the market by the Elastic Tip Co., 368 Atlantic Avenue,

Boston, Mass. They are built to give instant and lasting relief to tired, aching arches, and are made of leather with pneumatic rubber cushion backs. Patented pneumatic rubber tips cause air to circulate as pressure is brought upon the foot, thereby reducing excess perspiration. These tips also form the cushion support on the under side of the appliance. Packed twelve to the display box, Perfection Air Cells retail at $1.00 a pair.

Neoprene Test Clip Insulators

An improved test clip insulator, made from neoprene, has been introduced by the Mueller Electric Co., Cleveland, Ohio. The new product will not disintegrate when exposed to excessive



heat, oils, chemicals, or grease, and protects workers from "hot" clip possibilities. The neoprene test clip insulator is said to have already solved a problem on the test floor of a large electrical manufacturer where all clips are in almost constant contact with oil.

ABC Pipe Wrapping Tape

A special tape to meet the need of an efficient, economical and easily applied final pipe covering in ammonia, brine, air conditioning and refrigeration work, has been developed by the Superior Insulating Tape Company, St. Louis, Mo. The new tape, called ABC Pipe Wrapping Tape, consists of cotton fabric thoroughly impregnated with a specially prepared rubber compound. It is supplied in rolls containing 114 feet and in widths from ½ inch to 36 inches. The adhesive rubber compound of the tape adheres to the felt fibers, binding the felt firmly in place, thus preventing bulking and slipping due to vibration. It is said to be especially adaptable for use in tight places, bends, turns and oddly shaped fittings.

Protex Twin Sockets

Protex twin sockets, made of one-piece solid rubber into which all metal parts have been molded, are being marketed by the Daniel Woodhead Co., 15

North Jefferson St., Chicago, Ill. They are unbreakable and chip-proof, according to the manufacturer. One advantage of the solid rubber construction of these twin sockets lies in the protection given the lamp filament from breakage due to vibration of near-by heavy machinery. They are available in both screw base and plug-in base types.

New De Vilbiss Hose

The addition of a synthetic rubber gasoline pump hose to its line of solvent resisting hose has been announced by the De Vilbiss Company, Toledo, Ohio. The new hose features high resistance to gasoline and oil, positive seepage protection, controlled hose expansion, and minimum flow resistance, according to the company. Protection against fire hazards without loss of flexibility is said to be provided by an improved design of woven wire static eliminator.

Auburn Rubber Scotties

Known as "Scotty Strings," the Auburn Rubber Corp., Auburn, Indiana, is featuring three all-rubber "scotties" as a pull-toy novelty. The item consists of one large and two small "scotties", each mounted on colorful all-rubber wheels, and each connected

to the other by means of metal inserts. In all, the "string" measures 11 inches. Other "string" novelties merchandised by the company include all-rubber hop bunnies and a hen and chicks.

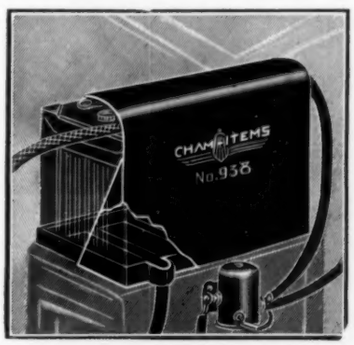
Goodrich Flexite Acid Bucket

A new and improved Flexite Acid Bucket, which provides greater safety for workmen who handle corrosive li-

quids, has been introduced by the B. F. Goodrich Co., Akron, Ohio. The reinforced bead on the base of the bucket has not only been enlarged but recessed to permit the worker to get a firm hold with his gloved hands. When the bucket is filled to capacity, the liquid is still two inches from the top, thus providing a needed safety margin. Graduated marks also enable the user to measure quantities accurately. Flexite buckets are available in the 3-gallon size only, weigh 3½ pounds each, and are furnished with steel or metal-reinforced hard rubber handles. Flexite dippers, in 1 and 2-quart sizes, are also available, and their use is recommended as an added protection against splashing and spilling.

Battery Drip Pan

A rubber battery drip pan for Model V-8 Fords, which prevents the leakings of batteries caused by acid expansion and seepage from getting on the starter



switch, motor, or other vulnerable parts, has been developed by the Champion Anti-Rattler Co., Inc., St. Louis, Mo. The molded rubber pan cushions the battery, prevents case cracking from road shocks, and eliminates rattles. A special air deflector, attached to the pan, deflects the air enough to allow the electrolite to flow down the side of the battery instead of being blown off on the dash.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, AUGUST 10, 1938

Crude Rubber

FOLLOWING the trend of the securities market, the price of spot rubber on the Exchange dropped from 15.10 on July 13 to 14.85 on July 14, and then started a steady rise until it reached 16.30 on July 27, high for the period. The steady rise was due in part to improved statistics on the domestic consumption of crude rubber and the revelation of a large decline in plant inventories of tires during June. Buying of domestic and foreign accounts, and better cables, also contributed to the improvement in prices. Weakness in foreign ruber markets plus commission house selling tended to bring prices below the 16-cent level during the first few days of this month, but renewed buying by factory interests in addition to trade short covering brought prices back above that level on August 5. Commission house liquidation served to bring the price down to an even 16-cent figure today (August 10). Prices are expected to remain firm for the next several weeks. Quotations in the outside market, Exchange, London and Singapore, follow:

As of August 10

Plantations—

Ribbed Smoked Sheets—			
No. 1 Spot	—	@	.16
October-December	—	@	.16 1/16
January-March	—	@	.16 1/4
No. 2	—	@	.15 1/2
No. 3	—	@	.14 7/8
No. 4	—	@	.14 5/8
Thin Latex Crepe	—	@	.16 1/4
Thick Latex Crepe	—	@	.17 5/8
Brown Crepe, No. 1	—	@	.15
Brown Crepe, No. 2	—	@	.14 1/2
Amber Crepe, No. 2	—	@	.14 1/2
Amber Crepe, No. 3	—	@	.14 1/2
Amber Crepe, No. 4	—	@	.14 3/8
Brown Crepe, Rolled	—	@	.12 7/8

Latex—

Normal, per lb., carload lots	—	@	.19

Paras—

Up-River, fine	—	@	.15 1/2
Acre Bolivian, fine	—	@	.15 1/2

Balata—

Surinam sheet	—	@	.38

LONDON MARKET

Standard Smoked Sheets—Buyers—August 10

October-December	—	@	7 7/8d
January-March	—	@	7 13/16d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—August 10

October-December	—	@	7 1/2d
January-March	—	@	7 1/16d

Reclaimed Rubber

Although business during the past thirty days was only slightly better than in the previous thirty-day period, reclaimers are quite optimistic for the immediate future. This optimism is based on resumption of activity in the automotive and building industries, as well as on the current Government program. There have been no changes in prices since our last report. Current quotations follow:

Shoe

Unwashed lb.	.06 1/2	@	.06 3/4
Washed lb.	.10	@	.10 1/4

Tube

No. 1 (Floating) lb.	.12	@	.12 1/4
No. 2 (Compounded) lb.	.08	@	.08 3/4
Red tube lb.	.08	@	.08 1/4

Tires

Black (acid process) lb.	.06 3/4	@	.07
Black, selected tires lb.	.06	@	.06 1/4
Dark Gray lb.	.09 1/4	@	.09 3/4
White lb.	.11 1/2	@	.12
Truck, Heavy Gravity lb.	.05 1/2	@	.06
Truck, Light Gravity lb.	.07	@	.07 1/2

Miscellaneous

Mechanical blends lb.	.04 1/2	@	.05

Scrap Rubber

(Delivered Akron Mills)

Scrap rubber dealers report revived activity from reclaimers and feel that the stagnant period which has existed for the past few months is definitely over. Since our last report, prices have been increased on mixed auto and beadless tire grades of scrap. Current quotations follow:

(Prices to Consumers)

Auto tire peelings ton	17.50	@	17.75
Mixed auto ton	10.00	@	12.00
Beadless tires ton	14.00	@	16.00
Clean solid truck tires ton	21.00	@	23.00
Boots and shoes ton	18.00	@	20.00
Arctics, untrimmed ton	12.00	@	14.00
Inner tubes, No. 1 lb.	.07	@	.08
Inner tubes, No. 2 lb.	.03 3/4	@	.03 7/8
Inner tubes, Red lb.	.03 3/4	@	.03 7/8

Cotton

Cotton prices swung in a fairly narrow margin—56 points—since our last report, acting erratically throughout the period. Intermittent rumors of boll weevil trouble in the south and recurring waves of foreign selling served to force prices down, while the confident tone of outside markets plus reports of steady rain in the cotton belt generally brought prices up again. High for the period was 8.92 on July 23; low was 8.36 on August 8. In preparation for the expected Government crop forecast, prices developed a sagging tendency early this month and then dropped sharply to 8.36 on August 8 when an estimate of 11,988,000 bales was officially announced. The prospect of early Government loans and a renewal of complaints of boll weevil activity brought the price up to 8.46 today (August 10). Quotations for middling uplands on the Exchange follow:

	July 11	August 10		
	Close	High	Low	Close
October	8.71	8.36	8.29	8.36
December	8.78	8.44	8.38	8.44
March	...	8.47	8.42	8.47

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3 lb.	.27	@	.27 1/4
Peeler, carded, 23/4/3 lb.	.28	@	.28 1/4
Peeler, carded, 15/3/3 lb.	.25	@	.25 1/4
Peeler, carded, 13/3/3 lb.	.24	@	.24 1/4
Egyptian, carded, 23/5/3 lb.	.40	@	.40 1/2
Egyptian, combed, 23/5/3 lb.	.45	@	.45 1/2
CHAFERS			
Carded, American, 1 1/16" lb.	.27 1/2	@	.28
Carded, American, 1" lb.	.19	@	.23 1/2

Sheetings

48x40	36 in.	5.50 lb.	—	@	.03 7/8
40x40	36 in.	6.15 lb.	—	@	.03 1/2
40x36	36 in.	6.50 lb.	—	@	.03 3/8
48x48	40 in.	2.50 lb.	—	@	.07 1/4
48x48	40 in.	2.85 lb.	—	@	.06 1/2
56x60	40 in.	3.60 lb.	—	@	.06
48x44	40 in.	3.75 lb.	—	@	.05 1/8
44x40	40 in.	4.25 lb.	—	@	.05

Ducks

Enameling (single filling) lb.	.21	@	.23
Belting and Hose lb.	.25	@	—
Single filling, A grade lb.	.09 1/2	@	.12 1/2
Double filling lb.	.10 1/2	@	.13 1/2

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 tons

FROM JULY 12 TO AUGUST 10

Date	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sales
July 12	15.10	15.10	15.14	15.19	15.22	15.26	15.30	15.32	15.33	15.35	15.37	15.40	15.43	——	347
13	15.10	15.05	15.15	15.25	15.28	15.31	15.30	15.37	15.40	15.43	15.47	15.52	15.57	——	344
14	14.85	14.84	14.87	14.91	14.95	14.99	15.03	15.05	15.10	15.14	15.15	15.17	15.19	——	262
15	14.96	14.95	15.02	15.08	15.14	15.19	15.25	15.28	15.31	15.34	15.37	15.40	15.43	——	232
16	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
17	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
18	15.50	15.48	15.51	15.54	15.58	15.63	15.67	15.73	15.75	15.78	15.81	15.84	15.87	——	335
19	15.50	15.47	15.50	15.54	15.58	15.62	15.67	15.68	15.70	15.73	15.76	15.79	15.82	——	276
20	15.38	15.36	15.40	15.45	15.48	15.52	15.54	15.56	15.59	15.60	15.63	15.65	15.67	——	483
21	15.50	15.51	15.52	15.54	15.58	15.63	15.68	15.71	15.74	15.77	15.80	15.83	15.86	——	250
22	15.80	15.78	15.81	15.85	15.88	15.91	15.95	16.00	16.01	16.03	16.06	16.09	16.12	——	454
23	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
24	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
25	16.05	16.00	16.04	16.08	16.11	16.14	16.15	16.23	16.25	16.26	16.30	16.32	16.34	——	458
26	15.90	15.87	15.90	15.93	15.95	15.99	16.03	16.05	16.09	16.13	16.15	16.18	16.21	——	453
27	16.30	——	16.27	16.30	16.34	16.38	16.42	16.45	16.46	16.46	16.51	16.55	16.59	——	485
28	16.30	——	16.27	16.30	16.34	16.38	16.42	16.43	16.45	16.47	16.50	16.54	16.58	——	282
29	16.12	——	16.08	16.10	16.16	16.21	16.25	16.25	16.27	16.28	16.30	16.34	16.38	——	177
30	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
31	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
Aug. 1	16.00	——	15.90	16.02	16.06	16.09	16.11	16.12	16.15	16.19	16.22	16.25	16.28	16.31	207
2	15.88	——	15.81	15.88	15.91	15.94	15.96	16.00	16.02	16.04	16.08	16.13	16.17	16.21	259
3	15.87	——	15.85	15.90	15.94	15.98	16.02	16.05	16.08	16.10	16.13	16.16	16.19	16.22	455
4	15.72	——	15.67	15.72	15.76	15.81	15.86	15.89	15.91	15.93	15.97	16.00	16.03	16.06	268
5	16.06	——	16.00	16.06	16.11	16.15	16.19	16.22	16.24	16.26	16.28	16.31	16.34	16.37	314
6	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
7	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
8	16.12	——	16.04	16.10	16.13	16.21	16.28	16.30	16.32	16.35	16.39	16.43	16.46	16.50	250
9	16.12	——	16.05	16.11	16.14	16.19	16.24	16.25	16.30	16.35	16.38	16.42	16.45	16.49	195
10	16.00	——	15.91	15.97	16.01	16.06	16.12	16.14	16.18	16.22	16.26	16.30	16.33	16.37	152

New York August 11, 1938 Rubber CHEMICAL Markets

All Quotations F.O.B. Works Unless Noted

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.26 @	—
A-5-10	lb.	.35 @	.40
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
A-433	lb.	.45 @	.55
Aldehyde ammonia, crystals	lb	.65 @	.70
Altax	lb.	.55 @	.70
Butyl Zimate	lb.	3.00 @	—
Captax	lb.	.50 @	.60
Crylene	lb.	.55 @	.65
paste	lb.	.45 @	.55
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.36
El-Sixty	lb.	.57 @	—
Ethyl Zimate	lb.	3.00 @	—
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.37½ @	.42
Guantal	lb.	.45 @	—
Heptene	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.36 @	—
Lead Oleate, No. 999	lb.	.14 @	—
Witco		.15 @	—
Lithex	lb.	.18 @	.20
Methylenedianiline	lb.	.36 @	.37
Monex	lb.	3.25 @	—
Oxynone	lb.	.64 @	.80
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	2.50 @	—
Pipsolene	lb.	1.55 @	1.85
R & H 40	lb.	.40 @	.41
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-23	lb.	.40 @	—
Rotax	lb.	.60 @	.65
Satex	lb.	1.20 @	1.25
SPDX	lb.	.75 @	—
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.20 @	.50
Thiocarbanilid, drums	lb.	.24 @	—
Trimene	lb.	.75 @	—
base	lb.	1.20 @	—
Triphenylguanidine	lb.	.60 @	—
Tuads	lb.	3.00 @	—
Ureka	lb.	.60 @	.75
Ureka Blend B	lb.	.60 @	.75
Ureka C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcone	lb.		
Vulcanol	lb.	.85 @	—
Z-88-P	lb.	.51 @	—
Zimate	lb.	3.00 @	—
Inorganic			
Litharge, domestic	lb.	.06¾ @	.07¼
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Compounding Materials)

Blues			
Prussian	lb.	.36 @	.37
Ultramarine	lb.	.15 @	—
Browns			
Mapico	lb.	.13 @	—
Umber, Turkey	lb	.04 @	.04½
Greens			
Chrome	lb.	.21 @	—
Chromium Oxide, bbl.	lb.	.21 @	—
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	.48 @	—
sulfur, free	lb.	.48 @	.60
Indian English	lb.	.09 @	.10
Domestic (Maroon)	lb.	.11 @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼ @	—
Whites			
Cryptone, No. 19	lb.	.05⅞ @	.06½
Cryptone CB, No. 21	lb.	.05⅞ @	.06½
Cryptone, ZS-20	lb.	.09 @	.09¼
Cryptone, ZS-86	lb.	.09 @	.09½
Lithopone			
Albalith, black label—11	lb.	.04⅜ @	.04¾
Azolith	lb.	.04⅜ @	.04¾
Ray-bar	lb.	.05⅞ @	.06⅜
Ray-cal	lb.	.05⅞ @	.06⅜
Rayox	lb.	.16 @	.19
Titanox A	lb.	.15 @	.18
Titanox B	lb.	.05⅝ @	.06⅝
Titanox C	lb.	.05⅝ @	.06⅝
Zinc Oxide—American Process			
American Azo: ZZZ (lead free)	lb.	.06¼ @	.06½
Anaconda, lead free	lb.	.06¼ @	.06½
Horsehead Lead Free Brand:			
Special—3	lb.	.06¼ @	.06½
XX Red—4	lb.	.06¼ @	.06½
XX Red—72	lb.	.06¼ @	.06½
XX Red—78	lb.	.06¼ @	.06½
XX Red—103	lb.	.06½ @	.06¾
Kadox, black label—15	lb.	.06½ @	.06¾
Blue label—16	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06¼ @	.06½
green label	lb.	.06¼ @	.06½
red label	lb.	.06¼ @	.06½
U. S. P—7, bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process			
Florence White seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.50 @	.55
Chrome	lb.	.14½ @	.15½
Mapico	lb.	.09½ @	—

BLACKS

Arrow "Aerfloted" Specification	lb.	.027 @	.036
Bone, powdered	lb.	.05½ @	.12½
Carbon, compressed	lb.	.0435 @	.0775
uncompressed	lb.	.0435 @	.0775
"Certified"	lb.	— @	—
Spherons	lb.	— @	—
"Disperso"	lb.	.027 @	.036
Drop, bbls.	lb.	.05½ @	.14
"Excello," compressed	lb.	.0435 @	.0775
"Fumonex"	lb.	.03 @	.07
"Gastex"	lb.	.03 @	.07
Lampblack	lb.	.07 @	.12
"Micronex"	lb.	.027 @	.036
"Supreme"	lb.	.0435 @	.0775
Thermatomic—"P 33"	lb.	.04¾ @	.07¾
"Thermax"	lb.	.01¾ @	.05
United "Dixie" & "Kosmos"	lb.	.027 @	.036

COMPOUNDING MATERIALS

Aluminum Flake	ton.	21.85 @	24.50
Ammonia carbonate, lump	lb.	.10½ @	.12
Asbestine	ton	13.00 @	15.00
Barium carbonate (98-100%)	ton	— @	—
Barium Dust	lb.	.05 @	.06
Barytes	ton	23.65 @	31.15
Basofor	lb.	.04½ @	—
Bentonite	lb.	.02 @	.03
Blanc fixe dry f.o.b. works	ton	60.00 @	65.00
Calcene	ton	37.50 @	45.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.40 @	60.00
heavy	ton	45.00 @	55.00
Clay, Kaolin, domestic	ton	7.50 @	15.00
Aerfloted, Suprex	ton	9.50 @	21.00
Congaree	ton	9.50 @	—
Crown (f.o.b. plant)	ton	9.50 @	—
Dixie	ton	11.00 @	30.00
Dixie, Jr.	ton	9.50 @	29.00
McNamee	ton	9.50 @	22.00
Par	ton	9.50 @	22.00
Witco	ton	9.50 @	—
Cotton Flock	lb.	.11 @	.15
Glues, extra white	lb.	.28 @	.30
medium white	lb.	.14 @	19
Kalite No. 1	ton	24.00 @	50.00
Kalite No. 3	ton	34.00 @	60.00
"Lime Crest" Industrial Filler No. 100	lb.	— @	—
Magnesium carbonate	lb.	.07½ @	—
Mica	ton	35.00 @	44.00
Pyrax A	ton	7.50 @	20.00
Rottenstone (powdered)	lb.	.02½ @	.03
Soapstone, powdered	ton	16.00 @	22.00
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00 @	20.00
Whiting, commercial	ton	17.00 @	18.00
Columbia Filler	ton	9.00 @	14.00
English Cliffstone	ton	33.00 @	43.00
Witco	ton	7.00 @	—
Wood Flour	ton	20.00 @	25.00
Zinc Carbonate	lb.	— @	.10¾
Zinc Stearate	lb.	— @	—

MINERAL RUBBER

285°-300° Mineral Rubber	ton	22.00 @	42.00
Black Diamond	ton	27.00 @	—
Genasco, solid (factory)	ton	25.00 @	27.00
Hard Hydrocarbon	ton	22.00 @	42.00
Parmr, solid	ton	25.00 @	—
Pioneer, MR, solid	ton		
Pioneer-granulated	ton		

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors No. 5145	lb.	2.00 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.40 @	—
Darvan (dispersing agent)	lb.	.30 @	.50
Santomerse (dispensing, wetting, penetrating and stabilizing agent)	lb.	.13 @	—
Sunproof	lb.	.35 @	.37½
Sponge Paste	lb.	— @	.80
Tackol (tackifier)	lb.	.115 @	—
Tonox	lb.	.56 @	.60

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.53 @	2.78
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulfuric, 66 degrees	ton	15.50 @	16.50
Acids, Fatty			
Laurex	lb.	.15 @	.16
Stearex Beads	lb.	.10¾ @	.11¾
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10½ @	.11¾
Alkalies			
Caustic Soda, 76%	cwt.	3.15 @	3.80
Soda Ash, 58%, C.L.	cwt.	— @	2.35
Oils			
Cycline Oil	gal.	.20 @	—
Degras, bbls.	lb.	.07¾ @	.08
Fluxrite	lb.	.05½ @	.06½
Palm Niger	lb.	.05½ @	.06½
Para-Flux	gal.	.17 @	—
Petrolatum, light	lb.	.03½ @	.03¾
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
Pine, steam distilled	gal.	.64 @	.69
dest. dist., drums	gal.	.49 @	.50
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rubtack	lb.	.08 @	.10
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	.07 @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Wobonite, c.l.	lb.	.05 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.05½ @	.06½
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	— @	.06¼
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33 @	.39
Benzene, 90%	gal.	.18 @	.23
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.65
Carbon, bisulfide	lb.	.05¼ @	.08
Carbon tetrachloride	lb.	.05¾ @	.08¼
Dichlorethylene	lb.	— @	.25
Dipentene, cml., drums	gal	.41 @	.50
Dryolene (f.o.b. Okla.)	gal.	.10 @	.10½
Ethylene dichloride	lb.	.05½ @	.06¼
Plastogen	lb.	.07¾ @	.12½
Reogen (drums)	lb.	.11½ @	.20
Rub-Sol (f.o.b. Okla.)	gal.	.09 @	
Trichlorethylene	lb.	— @	.09½
Turpentine, spirits	gal.	.43 @	.47
dest. dist., drums	gal.	.33 @	.41
Waxes			
Beeswax, white	lb.	.39 @	.45
Carnauba, yellow	lb.	.46 @	.47½
Ceresin, white, dom.	lb.	.08 @	.11
Montan, crude	lb.	.10¾ @	.11¾
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale	lb.	.02¾ @	—
White crude scale 124/126	lb.	.02¾ @	.03
Refined, 122/127	lb.	.04½ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.50 @	2.10
Exel	lb.	1.00 @	1.40
Gel	lb.	.57 @	.77
Hipar	lb.	.65 @	.92
Powder	lb.	.52 @	.73
Resin	lb.	.52 @	.73
Resin D	lb.	.52 @	.73
White	lb.	1.25 @	1.75
Albasan	lb	.70 @	..
Antox	lb.	.56 @	—
B-L-E	lb.	.57 @	.60
Flectol H	lb.	.54 @	—
Flectol White	lb.	1.00 @	—
Flectol B	lb.	.54 @	—
Neozone	lb.	.63 @	—
Oxynone	lb.	.68 @	—
Perflectol	lb.	.67 @	.75
Retardex	lb.	.35 @	.40
Santoflex A	lb.	— @	—
Santoflex B	lb.	.54 @	—
Stabilite	lb.	.57 @	.62
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.55 @	.60

MOLD LUBRICANTS

Aresklene	lb.	— @	—
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mold Paste	lb.	.18 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rusco, f.o.b. Nitro	lb.	.25 @	.30
Sericite, f.o.b. N. Y.	ton	65.00 @	—
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.19 @	—
Black	lb.	.07 @	.13½
White	lb.	.085 @	.15¼
Brown	lb.	.085 @	.14
Neophax	lb.	.11 @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.04 @	—
Sulfur flour.			
Refined, 100% pure (bags)	cwt.	2.50 @	3.65
Commercial (bags)	cwt.	1.60 @	2.35
Telloy	lb.	2.00 @	—
Vandex	lb.	2.00 @	—

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1922	301,076	101,843,188	15.10	4,809	1,921,828	17.84	296,267
1923	309,362	185,060,304	26.71	8,772	5,672,319	28.87	300,590
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1937:							
May	46,902	22,163,440	21.10	528	270,499	21.08	46,374
June	47,073	22,559,545	21.39	807	390,542	21.60	46,266
July	41,493	19,010,273	20.45	767	300,301	17.48	40,726
Aug.	48,020	20,595,314	19.15	670	265,298	17.69	47,350
Sept.	55,123	22 119,248	17.91	668	280,741	18.76	54,455
Oct.	51,171	20,250,893	17.67	450	172,466	17.13	50,721
Nov.	51,958	19,905,523	17.01	159	66,501	18.72	51,799
Dec.	68,006	24,934,206	16.37	290	91,764	14.14	67,716
1938:							
Jan.	43,984	15,115,732	15.34	325	118,514	16.27	43,659
Feb.	39,380	13,095,429	14.85	305	109,756	16.08	39,075
Mar.	41,592	13,494,654	14.48	646	198,865	13.74	40,946
Apr.	31,042	9,495,476	13.66	250	75,797	13.55	30,792
May	27,229	8,010,250	13.13	528	167,831	14.20	26,701
June	25,983	7,150,115	12.29	399	116,458	13.03	25,584

* Revised.

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1922, however, include both latex and guayule; guayule only is included in 1923. Annual figures for 1922-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Liquid Latex (1) Tons	Liquid Latex (1) Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,730	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1937:								
May	182	50,093	75	33,881	642	145,618	1,995	941,235
June	147	39,941	91	41,481	488	135,468	2,561	1,253,370
July	371	106,360	22	9,363	533	158,998	1,921	924,127
Aug.	335	95,893	16	5,876	363	107,611	1,801	838,778
Sept.	329	90,822	5	2,196	701	214,511	1,901	839,159
Oct.	247	68,178	29	12,090	460	149,516	1,958	844,205
Nov.	251	69,452	29	9,374	593	194,889	2,085	875,074
Dec.	140	34,347	31	11,491	1,325	470,553	1,804	694,164
1938:								
Jan.	538	147,685	23	8,958	598	224,443	1,400	494,242
Feb.	218	60,097	33	11,393	892	355,080	1,684	560,883
Mar.	150	41,518	69	19,454	587	239,271	979	327,844
Apr.	188	50,423	66	25,741	1,265	444,756	889	295,690
May	229	61,756	29	8,806	900	274,652	879	279,502
June	150	41,518	34	11,496	918	276,126	695	214,420

(1) Weight given in pounds of dry rubber contained in latex.

Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)

	1931*	1932*	1933*	1934*	1935*	1936*	1937*	1938
Jan.	28,640	29,648	22,645	39,190	46,636	48,631	50,879	29,429
Feb.	28,880	31,821	21,392	40,515	42,720	36,841	51,950	23,868
Mar.	32,883	29,505	17,843	47,003	42,153	42,813	54,129	30,487
Apr.	33,418	27,518	25,928	44,853	44,247	52,031	51,859	27,984
May	37,927	30,957	44,074	42,918	41,101	50,612	51,795	28,947
June	38,027	41,475	50,743	40,147	36,156	52,772	51,860	30,629
July	32,030	29,976	49,614	32,553	35,917	48,250	43,703	
Aug.	27,666	23,721	44,428	33,216	38,775	46,777	41,506	
Sept.	23,707	23,847	35,281	30,258	37,086	46,449	43,945	
Oct.	22,342	22,286	31,543	31,253	41,969	49,637	38,754	
Nov.	23,010	23,231	28,831	34,748	42,310	50,433	34,025	
Dec.	21,470	18,015	28,757	36,569	42,474	49,754	29,195	
Tot.	350,000	332,000	401,079	453,223	491,544	575,000	543,600	

* Revised.

Note: Figures for 1931-1937 were revised in May, 1938, and are now based on Department of Commerce survey figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks[a]	Year	Production	Consumption Tons	Consumption % to Crude	Stocks[a]
1928	208,516	223,000	50.4	24,785	1933	99,560	81,602	19.9	20,746
1929	218,954	226,588	48.4	27,464	1934	110,010	100,597	22.2	23,079
1930	157,967	153,497	40.8	22,000	1935	122,948	113,078*	23.0*	25,069
1931	133,351	124,126	33.9	19,257	1936	150,571	141,486*	24.6*	19,000*
1932	75,608	77,504	23.4	16,354	1937	178,776	157,990	29.1	26,260

Figures on Monthly Basis

1937:									
Jan.*	15,129	14,450	28.4	18,822	July	16,241*	12,128*	27.8*	17,682*
Feb.*	15,192	14,578	28.1	18,490	Aug.	16,543*	13,227*	31.9*	19,706*
Mar.*	14,462	15,601	28.9	16,450	Sept.	16,410	13,681	37.4	21,597
Apr.	13,884	15,607	30.1	14,046	Oct.	15,849	12,234	31.6	23,572
May	15,793	14,693	28.4	14,647	Nov.	12,406	9,703	28.6	24,620
June	16,052	14,414	27.8	14,535	Dec.	10,815	7,674	26.3	26,260
1938:									
Jan.	8,467	6,673	22.7	27,179	July	.....	.....	...	.....
Feb.	6,012	6,867	28.8	26,431	Aug.	.....	.....	...	.....
Mar.	6,669	8,573	27.1	24,401	Sept.	.....	.....	...	.....
Apr.	6,399	7,480	26.7	23,339	Oct.	.....	.....	...	.....
May	6,866	8,009	27.7	22,275	Nov.	....	.....	...	.....
June	7,584	8,274	27.0	21,040	Dec.	.....	.....	...	.....

[a] Stocks on hand at the end of month or year.

* Revised.

Note: Figures for 1936 were revised on June 1, 1937, and are now based on Department of Commerce survey figures.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1936*	1937	1938		1936*	1937	1938
January	32,344	33,696	35,176	August	46,061	49,597	
February	27,178	32,000	31,861	September	44,366	47,245	
March	35,864	40,561	41,259	October	44,163	45,361	
April	38,864	43,409	43,254	November	39,954	42,666	
May	42,010	45,484	44,911	December	39,590	39,457	
June	44,522	48,580	48,293				
July	46,865	50,704*		Total	481,606	518,760	

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1926	24,199,524	1930	17,364,096	1934	12,255,118
1927	19,700,003	1931	11,253,800	1935	18,664,356
1928	24,247,282	1932	6,261,336	1936	20,790,192
1929	24,141,502	1933	8,713,962	1937	22,257,964

1938		1938		1938	
January ...	527,899	May	706,188	September .	.....
February ..	477,600	June	527,121	October ...	.....
March	854,031	July	406,419	November ..	.....
April	970,345	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1936																																
May	15 1/8	15 1/8	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 1/8	15 3/4	15 1/8	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 1/8	15 1/8	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	—	—	15 3/4
June	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 1/8	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	15 3/4	—	15 3/4
July	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/2	16 1/8	16 1/8	16 1/4	—	—	16 3/4	16 5/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8
Aug.	16 1/8	16 1/8	16 1/8	16 1/8	16 1/4	16 1/8	16 1/8	16 1/8	16 1/8	16 1/4	16 1/8	—	—	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8
Sept.	16 1/8	16 1/8	16 1/8	16 1/8	16 1/2	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/2	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8
Oct.	16 1/8	16 1/8	16 1/2	16 1/8	16 1/2	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8	16 1/8
Nov.	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8
Dec.	18 1/8	18 1/8	18 1/8	19	19	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19	19	19 1/4	19 1/4	19 1/8	19 1/8	19 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	21 1/8	21 1/8	21 1/8	21 1/8	23	22 1/8	21 1/4	21 1/8	20
1937																																
Jan.	—	21	21 1/8	20 1/8	20 1/8	21 1/8	21 1/8	21 1/8	22 1/8	22 1/8	22 1/8	22 1/8	23 1/8	23 1/8	21 1/8	21 1/8	21 1/8	21 1/8	20 1/8	21 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	20 1/8	21 3/8
Feb.	21	21 1/8	21 1/8	21 1/8	21 1/8	21 1/8	21 1/8	21 1/2	22 1/8	22 1/8	23 1/8	23 1/8	23 1/8	23 1/8	23 1/8	23 1/8	23 1/8	23 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8
Mar.	21 1/8	26 3/8	26 3/8	26 3/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8	24 1/8
April	21	20 1/8	19 1/8	21 1/8	21 1/2	21 1/8	21 1/8	22 1/2	22 1/8	22 1/8	21 1/8	21 1/2	21 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8	22 1/8
May	20 1/8	19 1/8	18 1/2	19 1/8	18 1/8	19 1/8	19 1/8	19 1/8	18 1/8	18 1/8	18 1/8	18 1/8	18 1/8	18 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8
June	19 1/8	18 1/2	18 1/4	18 1/2	18 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8
July	18 1/8	18 1/8	17 1/4	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8
Aug.	18 1/8	18 1/8	18 1/4	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8
Sept.	18 1/8	18 1/8	17 3/4	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8
Oct.	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8
Nov.	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8	17 1/8
Dec.	15	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8
1938																																
Jan.	—	14 1/2	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 3/8
Feb.	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 7/16
Mar.	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	14 1/8	13 1/2
April	11 1/4	11 1/4	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8	11 1/8
May	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4	10 3/4
June	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8	11 3/8
July	15 1/4	15 1/4	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	12 1/2
August	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8	15 1/8

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1911-1930

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1911	141.30	1915	65.85	1919	48.70	1923	29.45	1927	37.72
1912	121.60	1916	72.50	1920	36.30	1924	26.20	1928	22.48
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.55
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98

Average Monthly Price per Pound Since 1930

	1931 Cents	1932 Cents	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents
Jan.	8.34	4.38	3.08	9.32	13.10	14.35	21.37	14.63
Feb.	7.70	4.03	2.95	10.45	12.92	15.48	21.33	14.71
Mar.	7.71	3.35	3.01	11.01	11.51	15.89	24.09	13.55
Apr.	6.43	3.02	3.56	12.10	11.55	15.98	23.44	11.84
May	6.49	3.09	4.95	13.26	12.05	15.62	21.14	11.57
June	6.35	2.66	6.15	13.51	12.57	15.85	19.29	12.57
July	6.37	2.89	8.01	14.60	12.10	16.49	18.86	15.37
Aug.	5.38	3.63	7.31	15.47	11.98	16.25	18.37	
Sept.	5.08	3.84	7.30	15.36	11.55	16.46	18.55	
Oct.	4.87	3.65	7.64	13.96	12.62	16.55	16.28	
Nov.	4.65	3.44	8.66	13.04	13.15	17.97	14.60	
Dec.	4.64	3.24	8.87	12.98	13.28	20.01	15.41	
Average for Year	6.17	3.49	5.96	12.92	12.37	16.41	19.39	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1938 May	1938 June	1938 July	1938 Aug.	Day	1938 May	1938 June	1938 July	1938 Aug.
1	—	5 5/16	7 1/4	—	17	5 11/16	5 11/16	—	—
2	5 7/16	5 5/16	—	7 1/16	18	5 3/4	—	7 3/16	—
3	5 5/8	5 1/16	—	7 1/16	19	5 11/16	—	7 1/8	—
4	5 5/16	—	7 1/2	7 1/16	20	5 1/2	6 1/16	7 1/2	—
5	5 5/16	—	7 1/4	7 1/16	21	5 1/2	6 1/16	7 1/16	—
6	5 1/4	—	7 1/4	—	22	—	6 1/16	7 1/16	—
7	5 3/4	5 1/16	7 1/16	—	23	5 3/8	6 1/16	—	—
8	—	5 1/16	7 1/4	7 1/16	24	5 1/2	6 3/4	—	—
9	5 5/16	5 1/16	—	7 1/16	25	5 5/8	—	7 3/4	—
10	5 3/8	5 1/8	—	7 1/16	26	5 1/2	—	7 5/8	—
11	5 7/8	—	7 1/4	—	27	5 7/16	6 1/8	7 1/16	—
12	5 7/16	—	7 1/8	—	28	5 5/16	6 7/8	7 1/16	—
13	5 7/8	5 1/16	7 1/8	—	29	—	6 7/8	7 1/16	—
14	5 5/8	5 1/16	7 1/4	—	30	5 5/8	7 1/4	—	—
15	—	5 1/16	7 1/16	—	31	5 5/8	—	—	—
16	5 11/16	5 7/8	—	—					

Average Monthly Price Per Pound

Month	1935 Pence	1936 Pence	1937 Pence	1938 Pence	Month	1935 Pence	1936 Pence	1937 Pence	1938 Pence
Jan.	6.434	6.758	10.378	7.077	Aug.	5.696	7.581	8.830	
Feb.	6.292	7.255	10.503	7.029	Sept.	5.508	7.577	8.935	
Mar.	5.745	7.450	11.766	6.590	Oct.	6.130	7.898	7.855	
Apr.	5.604	7.502	11.471	5.793	Nov.	6.308	8.572	7.080	
May	5.822	7.335	10.250	5.632	Dec.	6.340	9.580	7.332	
June	6.027	7.352	9.548	6.147	Average for Year	5.976	7.713	9.424	
July	5.801	7.696	9.136	7.464					

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1938 June	1938 July	1938 Aug.	Date	1938 June	1938 July	1938 Aug.	Date	1938 June	1938 July	1938 Aug.
1	7.89	9.01	8.61	11	8.24	8.79		22	8.68	8.83	
2	7.84	9.12	8.59	12	—	8.84		23	8.77	8.92	
3	8.03	—	8.56	13	8.16	8.67		24	8.82	—	
4	8.06	—	8.61	14	8.29	8.68		25	8.85	8.87	
5	—	9.03	8.52	15	8.33	8.69		26	—	8.79	
6	7.89	9.21	8.53	16	8.39	8.64		27	8.81	8.76	
7	7.89	9.04	—	17	8.43	—		28	8.82	8.67	
8	7.89	9.17	8.36	18	8.51	8.72		29	8.85	8.67	
9	8.11	9.03	8.36	19	—	8.81		30	8.80	8.72	
10	8.19	—	8.46	20	8.62	8.74		31	—	—	
				21	8.71	8.88					

Average Monthly Price Per Pound

	1935 Cents	1936 Cents	1937 Cents	1938 Cents		1935 Cents	1936 Cents	1937 Cents	1938 Cents
Jan.	12.70	11.91	13.06	8.57	Aug.	11.48	12.28	10.41	
Feb.	12.58	11.53	13.15	8.91	Sept.	10.80	12.31	9.02	
Mar.	11.63	11.43	14.46	8.92	Oct.	11.28	12.30	8.42	
Apr.	11.73	11.71	14.23	8.76	Nov.	12.01	12.23	7.96	
May	12.25	11.68	13.34	8.50	Dec.	11.99	12.83	8.26	
June	11.89	12.02	12.70	8.38	Average for Year	11.88	12.11	11.44	
July	12.26	13.11	12.26	8.85					

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1936	ON HAND 1937	ON HAND 1938	AFLOAT 1936	AFLOAT 1937	AFLOAT 1938	ON HAND AND AFLOAT 1936	ON HAND AND AFLOAT 1937	ON HAND AND AFLOAT 1938
Jan.	296,683	204,436	274,581	43,870	55,096	57,356	340,553	259,532	331,937
Feb.	293,631	195,692	294,338	46,532	53,538	47,459	340,163	249,230	341,797
Mar.	284,561	192,980	299,172	58,935	56,994	41,882	343,496	249,974	341,054
Apr.	277,478	176,289	301,436	47,678	72,530	39,071	315,156	248,819	340,507
May	262,415	175,273	299,720	48,860	58,542	32,859	311,275	233,815	332,579
June	245,544	172,056	294,566	47,228	57,215	32,079	292,872	229,271	326,645
July	235,850	167,094		60,343	75,779		296,193	242,873	
Aug.	230,167	174,195		63,597	80,439		293,764	254,634	
Sept.	233,336	186,193		62,240	83,288		295,576	269,481	
Oct.	224,000	200,025		67,825	80,653		291,825	280,678	
Nov.	211,480	222,707		73,691	81,302		285,171	304,009	
Dec.	223,000	262,204		56,567	63,099		279,567	325,303	

* Revised.

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1936	London 1937	London 1938	Liverpool 1936	Liverpool 1937	Liverpool 1938
January	84,791	29,005	40,203	77,188	41,895	21,711
February	79,757	26,508	46,596	77,138	37,078	24,737
March	74,779	21,292	50,233	72,823	30,622	26,220
April	68,932	21,128	54,296	71,388	27,443	28,277
May	61,349	21,351	57,194	69,150	25,081	29,862
June	55,993	21,964	60,307	66,173	21,258	31,837
July	49,575	22,589		63,715	19,424	
August	45,749	25,211		62,367	19,817	
September	44,364	28,462		59,485	21,190	
October	40,777	30,465		55,738	21,327	
November	37,495	33,304		51,184	21,399	
December	33,027	35,633		45,291	21,978	

(Figures from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

	Penang and Singapore [1]	Malaya [3]	Ceylon [3]	Holland	Para and Manaos
At end of 1937					
July	44,759	43,270	3,725	124	1,050
August	47,873*	44,775	4,454	144	1,133
September	49,438*	38,131	5,294	135	1,543
October	41,948*	43,900	4,743	117	1,780
November	38,778	45,854	5,378	105	2,901
December	44,792*	45,734	5,632	100	1,771*
At end of 1938					
January	48,494*	49,643	5,976	131	2,024
February	46,241	47,990	5,653	169	2,342
March	50,797	48,473	5,490	180	1,212
April	40,614	45,008	4,812	155	1,083
May	40,598	45,426	4,876	169	816

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

End of: 1937	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
April	72,530	34,410	17,060	124,000
May	58,542	31,500	26,958	117,000
June	57,215	34,700	33,085	125,000
July	75,779	45,100	23,121	144,000
August	80,439	40,300	19,261	140,000
September	83,288	37,400	20,312	141,000
October	80,653	35,000	19,347	135,000
November	81,302	39,100	6,598	127,000
December	63,099	45,100	26,801	135,000
End of: 1938				
January	57,356	40,500	15,144	113,000
February	47,459	44,200	16,341	108,000
March	41,882	44,700	22,418	109,000
April	39,071	42,960	31,969	114,000
May	32,859	36,000	25,141	94,000
June	32,079	36,000	25,921	90,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.
P—Preliminary estimate.

TOTAL PRINCIPAL WORLD STOCKS

(Figures from the Survey of Current Business)

At end of	1933	1934	1935	1936*	1937	1938
January	634,797	661,948	698,153	600,479	454,249*	551,632*
February	626,227	663,308	686,195	599,355	445,265*	569,242*
March	638,428	666,382	678,809	583,318	447,856*	591,968
April	629,159	658,796	677,006	567,172	428,249*	593,340
May	626,537	689,239	677,569	541,871	413,134*	577,063*
June	613,055	672,804	671,525	520,255	434,250*	581,952
July	618,258	676,200	679,061	519,074	445,782	
August	617,449	674,702	680,644	500,520	457,462*	
September	623,683	694,361	661,509	493,585	470,768*	
October	636,597	680,616	655,000	486,159	479,398*	
November	642,968	684,408	617,300*	466,491	493,266*	
December	654,890	705,975	613,987*	466,576	545,533*	
Monthly Avge.	630,171	677,395	666,397*	528,738	460,022*	

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis — Quarter	1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	12,323	11,004	6,635	13,437	13,355	11,798	16,142	7,714
Apr.-June	16,295	12,980	14,412	13,565	12,597	15,443	16,421	8,660
July-Sept.	12,004	9,245	14,707	9,822	11,312	15,467	12,659	
Oct.-Dec.	8,117	6,856	9,550	10,406	12,099	15,409	10,063	
Total	48,739	40,085	45,304	47,230	49,363	58,117	55,285	

Shipment Figures on Quarterly Basis — Quarter	1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	11,268	8,760	6,981	10,730	11,154	10,944	14,667	7,716
Apr.-June	15,919	18,021	15,139	14,998	13,473	16,530	16,324	10,596
July-Sept.	14,354	8,141	13,707	11,648	13,489	14,558	13,591	
Oct.-Dec.	8,510	5,329	8,265	9,310	12,066	13,331	10,864	
Total	50,051	40,251	44,092	46,686	50,182	55,363	55,446	

Inventory Figures [2] — Quarter	1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar	10,014	9,878	7,290	11,651	11,675	9,087	12,488	10,808
Apr.-June	10,447	4,999	6,615	10,219	10,755	7,835	12,529	8,812
July-Sept.	8,158	6,096	7,595	8,419	8,288	9,012	11,615	
Oct.-Dec.	7,775	7,644	8,888	9,455	8,196	11,114	10,767	

Figures for Recent Months

	PRODUCTION 1936	1937	1938	SHIPMENTS 1936	1937	1938	INVENTORY [2] 1936	1937	1938
Apr.	4,857	5,730	2,706	4,904	5,560	3,199	11,003	12,629	10,317
May	4,974	5,352	2,842	5,833	5,375	3,372	11,131	12,592	9,855
June	5,612	5,339	3,112	5,793	5,389	4,025	10,755	12,529	8,812

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis — Quarter	1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	11,989	10,721	6,230	12,823	12,553	11,935	15,714	6,938
Apr.-June	15,388	11,913	13,001	13,191	11,631	14,678	15,299	7,051
July-Sept.	12,839	8,286	14,356	10,321	11,270	15,377	11,949	
Oct.-Dec.	8,117	5,970	9,000	9,891	12,425	15,257	9,024	
Total	48,333	36,890	42,587	46,226	47,879	57,247	51,986	

Shipment Figures on Quarterly Basis — Quarter	1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	11,251	8,918	6,539	10,640	11,252	11,410	14,498	6,969
Apr.-June	15,314	16,271	13,292	14,553	11,928	15,169	15,381	9,118
July-Sept.	15,282	7,761	13,370	11,545	13,251	15,125	12,805	
Oct.-Dec.	8,174	4,961	8,189	8,306	11,636	12,921	9,693	
Total	50,021	37,911	41,390	45,044	48,067	54,625	52,377	

Inventory Figures [2] — Quarter	1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	10,475	9,448	6,369	10,244	10,406	8,692	11,904	10,093
Apr.-June	10,504	5,174	6,097	8,795	10,050	8,105	11,746	8,106
July-Sept.	8,095	5,753	7,008	7,639	7,565	8,627	11,242	
Oct.-Dec.	7,922	6,749	7,815	9,180	8,231	10,985	10,235	

Figures for Recent Months

	PRODUCTION 1936	1937	1938	SHIPMENTS 1936	1937	1938	INVENTORY [2] 1936	1937	1938
Apr.	4,824	5,627	2,142	4,746	5,325	2,704	8,788	12,218	9,525
May	4,819	4,956	2,229	4,919	5,028	2,843	8,719	12,107	9,010
June	5,035	4,716	2,680	5,504	5,027	3,571	8,105	11,746	8,106

[1] Based on reports received from the Rubber Manufacturers Association.
[2] Held by manufacturers at end of period indicated.

Automobile Production

	United States Total	United States Passenger Cars	United States Trucks	Canada Total	Canada Passenger Cars	Canada Trucks	Grand Total
1928	4,357,384	3,826,613	530,771	242,382	196,737	45,645	4,599,944
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933*	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934*	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935*	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936*	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937*	4,808,974	3,915,889	893,085	207,000	152,631	54,369	5,015,974
1937*							
Oct.	329,876	298,662	31,214	8,103	7,378	725	337,979
Nov.	360,055	295,328	64,727	16,574	13,793	2,781	376,629
Dec.	326,234	244,385	81,849	20,652	14,384	6,268	346,886
1938							
Jan.*	209,506	155,505	54,001	17,624	13,385	4,239	227,130
Feb.*	186,523	139,380	47,143	16,066	11,753	4,313	202,589
Mar.*	221,796	174,065	47,731	16,802	12,276	4,526	238,598
Apr.	219,314	176,078	43,236	18,819	14,033	4,786	238,133
May	192,068	154,958	37,110	18,115	13,641	4,474	210,183
June	174,667	136,531	38,136	14,732	11,014	3,718	189,399

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]								DUTCH EAST INDIES [6]						
	Gross Exports	Imports	Gross Exports Minus Imports	Ceylon [2]	India & Burma [3]	Sarawak [4]	British North Borneo [5]	Siam [4]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China [3]	Amazon Valley	All Other [6]	World Total [7]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,345	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	35,551	83,978	125,969	208,699	43,387	15,576	12,721	1,120,576
1937:															
Jan.	41,571	16,956	24,615	4,514	1,066	4,015	1,234	3,849	5,136	7,962	13,067	2,823	1,271	943	70,495
Feb.	38,058	14,048	24,010	5,603	1,876	2,015	790	3,554	5,484	7,616	12,486	3,081	1,692	929	69,136
Mar.	59,568	19,579	39,989	7,049	2,034	1,425	1,239	3,873	7,856	11,817	19,903	3,160	1,749	872	100,966
Apr.	58,718	17,136	41,582	3,419	1,186	2,960	783	1,899	6,999	8,916	15,944	2,098	1,522	962	88,270
May	51,152	17,350	33,802	4,607	1,007	742	778	2,238	7,530	8,939	20,835	2,888	1,063	1,010	85,439
June	54,809	23,614	31,195	5,149	1,092	1,890	813	2,933	8,269	12,290	24,804	3,673	762	945	93,815
July	71,863	26,100	45,763	6,279	966	2,543	1,414	3,175	7,512	11,557	23,520	5,563	854	1,416	110,562
Aug.	64,525	21,395	43,130	7,308	605	1,624	1,189	2,999	6,785	11,563	21,014	2,277	1,248	1,283	101,025
Sept.	67,414	19,065	48,349	5,804	1,092	2,659	969	3,173	6,402	10,862	19,611	4,131	1,007	1,145	105,204
Oct.	59,319	11,858	47,461	6,701	1,248	523	1,505	2,352	6,587	12,172	14,188	3,753	1,434	1,147	99,071
Nov.	57,850	12,396	45,454	4,391	2,135	2,517	1,327	2,549	6,310	10,003	11,596	4,556	963	1,037	92,838
Dec.	56,791	13,949	42,842	9,529	2,708	3,009	1,172	2,957	9,108	12,272	11,731	5,384	2,011	1,032	103,755
1938:															
Jan.	47,986	17,078	30,908	5,013	1,379	3,485	1,307	2,897	4,476	9,283	12,501	6,086	878	1,400*	79,613
Feb.	48,899	11,874	37,025	5,216	1,423	8	918	3,266	6,391	8,793	12,023	3,068	1,542	1,400*	81,056
Mar.	49,197	15,813	33,384	3,834	1,247	1,564	853	2,837	5,668	10,156	15,284	3,213	1,831	1,200*	80,209
Apr.	53,864	9,158	44,706	1,951	1,347	1,728	1,158	1,583	5,967	10,081	12,274	3,647	1,004	1,200*	86,644
May	38,245	10,325	27,920	2,864	1,283	1,648	815	2,554	4,575	7,515	9,741	3,118	1,053	1,200*	64,286
June	42,258	14,394	27,864	3,705	1,324	2,441	643	2,500*	4,519	7,788	11,899	3,000*	750*	1,200*	67,633

(1) Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, 3,263 in 1926, 2,439 in 1927, 1,437 in 1928, 2,670 in 1929, and 1,274 in 1930. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments were equivalent to 18 tons in 1923, 93 tons in 1924, 6 tons in 1925, 20 tons in 1926, about ½ ton in 1927, and 1 ton in 1928, and practically none in 1929, 1930 and 1931. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons in 1924, 2,239 tons in 1925, 44 tons in 1926, 84 tons in 1927, 1,459 tons in 1928, 1,302 tons in 1929, and 2,656 tons in 1930. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Belgium and Netherlands, and includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. * Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,379	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,646	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	28,904	19,164	14,970	4,343	4,680	2,400	13,063	1,063,798
1937:															
Feb.	44,398	—222	5,296	7,911	1,271	6,630	1,502	3,048	304	1,363	245	452	200*	837	73,235
Mar.	39,888	343	5,347	7,668	2,612	6,935	2,119	3,598	1,293	1,641	371	709	200*	601	73,325
Apr.	42,066	3,808	5,291	8,664	1,343	5,837	1,669	1,532	1,058	1,069	362	1,070	200*	1,445	75,414
May	48,506	6,100	5,558	6,706	4,187	8,596	2,772	1,886	1,290	2,113	361	1,576	200*	925	90,776
June	48,972	5,157	6,010	6,469	3,791	7,608	1,958	3,940	2,226	1,630	521	1,802	200*	1,150	91,434
July	43,018	10,628	4,306	7,860	1,946	4,851	2,719	2,150	1,902	851	497	1,409	200*	753	83,090
Aug.	49,485	15,757	4,488	8,752	3,506	4,409	2,569	1,226	2,153	1,013	382	1,386	200*	1,692	97,018
Sept.	56,685	15,671	4,820	10,595	2,396	3,666	1,941	1,391	3,184	1,258	337	1,648	200*	1,369	105,161
Oct.	52,926	11,899	4,278	8,076	5,998	2,059	951	2,500*	2,470	967	367	1,535	200*	988	95,214
Nov.	54,135	12,878	4,311	8,848	4,787	1,368	2,857	2,500*	1,935	925	313	970	200*	846	96,873
Dec.	69,660	10,655	5,736	9,580	2,619	1,995	1,976	2,500*	767	1,286	318	1,008	200*	1,890	110,190
1938:															
Jan.	45,596	15,458	4,769	6,314	1,789	4,935	1,857	2,693	574	1,257	300	1,239	200*	1,102	86,083
Feb.	40,977	16,505	5,456	6,959	615	3,173	2,053	2,341	578	974	534	1,114	200*	1,771	82,843
Mar.	42,075	15,911	4,845	10,768	2,123	6,222	1,365	2,162	1,043	961	342	1,088	200*	1,324	90,429
Apr.	31,870	14,653	5,757	6,497	999	5,456	2,397	4,281	640	904	449	971	200*	920	75,994
May	27,809	14,675	5,169	9,595	2,545	5,000*	2,422	2,000*	1,053	1,137	419	1,283	200*	957	74,264
June	26,429	14,053													

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1] United States imports of guayule are included in this compilation. * Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE: THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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